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NETHERLAND PLAZA CINCINNATI, OHIO

Volume XVIII

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No. 5

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No. 5

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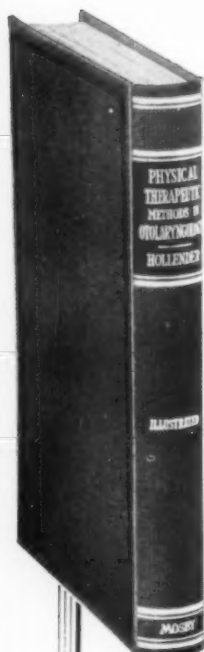
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# THE SUPPOSED SPECIFIC EFFECT OF HIGH FREQUENCY CURRENTS ON SOME PHYSIOLOGICAL PREPARATIONS

Part I. Reaction of a Nerve Muscle Preparation to Stimulation  
Part II. On an Isolated Frog's Heart

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and

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St. John Clinic and Institute of Physical Medicine

LONDON

## Part I

It has been shown by Danilewsky and Worobjew<sup>1</sup> that if minimum faradic stimuli were applied to the nerve of a frog nerve muscle preparation and an apparatus generating high frequency currents was switched on near by, the resultant contractions increased in amplitude. On switching off the H. F. generator the excitability of the nerve rapidly returned to its original value. The frequencies used were of the order 500,000 to 1,000,000 per second (600 — 300 m.). With increasing strength of irradiation a point was reached where a depression in the excitability resulted. If the preparation was connected to earth, an increased effect was obtained. Increase and decrease of excitability were also obtained on irradiating the sciatic nerve of a warm-blooded animal.

Audiat<sup>2</sup> stated that the excitability of a nerve muscle preparation diminishes under the action of hertzian waves. He claimed this to be a "specific effect" since heat has the opposite effect.

D'Arsonval<sup>3</sup> pointed out that the action of H. F. currents on motor nerve was to produce a state of anesthesia, an effect which lasted for some time after the H. F. current was switched off.

Delherm and Fischgold<sup>4</sup> also claim that H. F. currents diminish the excitability of the nerve muscle preparation and that the diminished excitability is similar to that produced by the anodic effect of a direct current. More recently Weissenberg<sup>5</sup> has demonstrated that an interrupted H. F. current applied to a nerve muscle preparation of a frog shows stimulating effects similar to those obtained by the application of a weak direct (galvanic) current at make and break. This he asserts shows that the nerve rectifies a small portion of the applied H. F. current. With regard to this rectification effect the earliest reference we can find is the work of Blake<sup>6</sup> who obtained as he claimed evidence of a rectification effect when asymmetrical electrodes were used for the application of H. F. currents to the body. More recently and independently Gosling<sup>7</sup> has made the same suggestion. We have made an attempt to clarify the action of H. F. currents on a nerve muscle preparation. The first point we would like to emphasize is that in all previous work effects were caused by a wavelength range of 600 to 10 m. We therefore feel that there is no practical reason to investigate any specific effect of a definite wavelength.

## Experimental Method

The muscle of a frog nerve muscle preparation is fastened in the usual way, one end to a cork plaque, and the other to a lever set to write on a drum. Two platinum wires connected to a du Bois-Raymond coil fitted

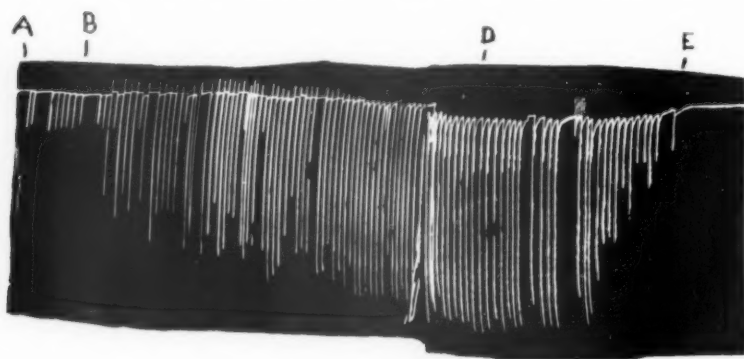


Fig. 1.

Fig. 1. — Effect of increasing strength of H. F. current on the excitability. A — B, normal excitation; A plus B, H. F. current switched on. The excitability rises to a maximum at D and then falls off to E as the strength of the H. F. current increases.

with a switch to give single excitations, were used as the stimulating electrodes. The nerve was laid across them and kept slightly moistened with Ringer's solution. The following experiments were carried out.

The strength of the faradic stimulation was adjusted to be minimal for single excitations. At a distance of about 1 meter a 6-m. Ultra Therm apparatus was switched on, its secondary circuit being tuned to resonance. If the nerve was now stimulated as before, a marked increase in the excitability was found. If the H. F. generator was moved away the excitability although still raised as compared with normal, was slightly lowered, and if the apparatus was moved nearer the preparation, the excitability was further increased (fig. 1). On switching off the H. F. generator the excitability of the nerve regained its former value (fig 2). Similar effects were

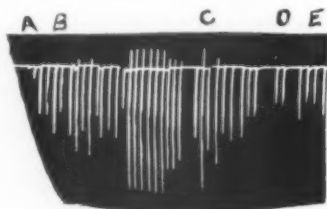


Fig. 2.

Fig. 2. — To show that excitability returns to normal on switching off H. F. current. A — B, normal excitation; H. F. switched on at B. B — C, increased excitation, H. F. current switched off at C. D — E, normal excitation.

obtained with the induction coil type apparatus and with an ordinary diathermy of 600 meters. With the latter the electrode circuit had to be considerably nearer than with the other two machines in order to produce an effect. This confirms the observations of Danilewsky and Worobjew mentioned above, who however, claim that the H. F. field is affecting the nerve directly.

One of us (H. J. T.) did not agree with this, and thought that the H. F. current was being picked up by the leads from the du Bois-Raymond coil and applied to the preparation via the stimulating electrodes. To show if this were the case or not, we placed the coil and the leads to the preparation in a wire box connected to earth, leaving the preparation outside. Under this condition of shielding no effect on the preparation due to the H. F. generator was noticed, thus we proved that the effect is due to the H. F.

current which was picked up by the leads running from the du Bois-Raymond coil to the preparation. It was found as would be expected that under this condition earthing of the preparation itself when the leads were unshielded increased the excitability of the nerve still further. When the strength of the H. F. current picked up by the leads and conveyed to the nerve was increased it was found that a point was reached where a depressive effect on the excitability of the nerve was obtained. If now the H. F. generator was switched off the excitability of the nerve did not regain its former value but seemed to be permanently lowered. If instead of increasing the strength of the H. F. current gradually, this was done rapidly the muscle might go into tetanic contractions (fig. 3), which might continue

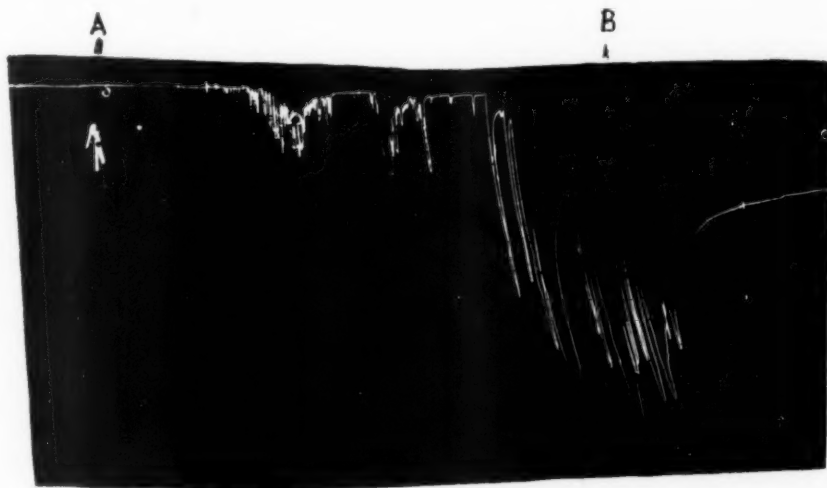


Fig. 3.

Fig. 3. — Tetanus produced by high intensity of H. F. current. H. F. current switched on at A, off at B.

for some time after the H. F. current was switched off. If the current was still further increased, the nerve coagulated and steam arose from it.

To summarize, the following effects take place:

- (a) With weak H. F. currents excitability of nerve muscle preparation is markedly increased.
- (b) With stronger H. F. currents, and excitability permanently decreased, the muscle might go into tetanic contractions.

We next attempted to investigate the causes of these phenomena remembering that (a) and (b) effects may not be due to the same cause. The first explanation that comes to mind is that the nerve is being heated by the H. F. current so we carried out an experiment in which a continuous flow of Ringer's solution at room temperature was allowed to run over the nerve. This prevented increased excitability of the nerve (fig. 4) except when a very much higher intensity of H. F. current was used, in fact, one by which without the Ringer's solution the nerve would be coagulated. This experiment in itself was not conclusive since it might be argued that the Ringer's solution itself was short circuiting the H. F. current, so that only a part of the current was flowing through the nerve. We repeated this experiment but cooling with liquid paraffin at about 6 degrees C. A similar effect was noticed, but not so marked as in the case of the Ringer's solution. This we attributed to the low cooling power of liquid paraffin. Next we immersed the nerve and electrodes in a small quartz vessel containing liquid

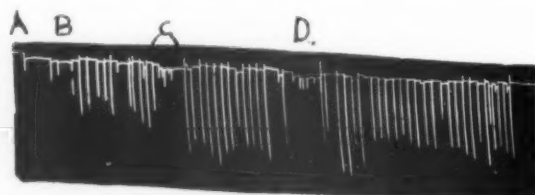


Fig. 4.

Fig. 4. — Effect of cooling with Ringer's solution. A — B, normal excitations; H. F. current switched on at B. At C and D nerve between electrode cooled with Ringer's solution.

paraffin at about 6 degrees C. The quartz vessel was resting on a block of ice. To produce the increased excitability of the nerve a higher H. F. current had to be used; one could, however, with these higher intensities even produce coagulation and steaming of the nerve while immersed in the cold paraffin. These results inclined us to the view that heat was playing an important part in producing the effects we had noticed.

Our next experiment therefore was to compare the effect produced by directly heating the nerve. This we did by placing a thin platinum wire round the nerve and about 3 mm. distant from it, and heating the loop by a current from the D. C. mains. The temperature of the loop was controlled by regulating the current through it with a variable resistance. With the platinum loop just below redness a marked increase in the excitability of the nerve muscle was obtained (fig. 5). With an increase in the tem-

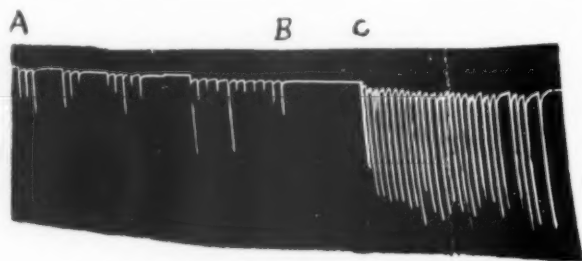


Fig. 5.

Fig. 5. — Effect of external heat on the excitability of the preparation. A — B, Normal contractions. At B current switched on to platinum loop. Increased excitation shown at C.

perature of the loop the muscle went into tetanic contractions in a manner similar to that with the H. F. current (fig. 6). The condition of tetanus went on for some time after the platinum loop was removed, just as it did in the case of the H. F. current. With the higher temperature a depression of excitability was found, also in a similar manner to that produced by the H. F. current.

The comparison of the two effects (by heat and H. F. current) is most striking and one has no hesitation in saying that the effects on the nerve muscle preparation by the H. F. current are due to heat. The fact that the tetanic condition of the muscle went on for some time after the H. F. current or the heat as the case may be was switched off led us to suppose that the prolonged tetanus was due to the initiation of a dying process which went on. This similarity led us to think that this might be a drying process since it is well known that a tetanus is produced by this means; the outer layer of the nerve being dried first, and the drying process spreading through the bundle of nerve fibers. The depth to which the process spread was shown by the increase of a faradic stimulus required



Fig. 6. — *A*, Tetanus produced by H. F. current; *B*, Tetanus produced by external heat.



Fig. 7. — Effect of H. F. current on heart beat; *A* — *B*, normal contractions, H. F. current switched on at *B*. When the excursions become small and rapid at *C* it is cooled with Ringer's solution. The contraction *C* — *D* returns to normal.



to excite the nerve. Figure 6 shows the record of a tetanus produced by drying a nerve with a small piece of filter paper. In this case moistening of the nerve with Ringer's solution stopped the tetanus contrary to what we obtained with the H. F. current. We believe that in the latter case coagulation on the surface prevents moisture from penetrating. Of interest in this connection is a recent paper by Young<sup>8</sup> on the structure of nerve fibers in Cephalopodes and Crustacea in which the author shows that the substance of the axon is a rather viscous fluid, the faint visible striation suggesting the presence of longitudinal orientated micellae which by coagulation produce the more definite fibers seen in damaged axons.

We made an attempt to find out if the effects could be produced in man. One electrode from a du Bois-Raymond induction coil was connected to a saline pad placed over the ulnar nerve, the other electrode being placed at the motor point of the *flexor digiti minimi*. The strength of the faradic stimulation was adjusted so that it was minimal. The arm was then placed in the H. F. field of the electrodes of a 6 m. generator. No increase in excitability was found. The circulation prevented any marked heating of the nerve. Since all the effects on the nerve muscle preparation produced by H. F. current can be reproduced exactly by the external application of heat, it seems unnecessary to consider the suggestion of any effect being produced by rectification.

### Summary

We have shown that a weak high frequency field corresponding to wavelengths of 600, circa 22, and 6 meters increases the excitability of nerve muscle preparation. With stronger currents a depression of excitability was obtained, also the muscle may at times go into tetanus.

Exactly similar effects may be produced by a hot wire placed near the nerve. This leads us to conclude that the action of the high frequency current is one of heat.

### Part II

Pflomm<sup>9</sup> states that if a frog's heart preparation is placed in the short wave field the beats become slower and the excursions lessened, finally the diastolic beat ceases. If now the H. F. field is switched off the heart gradually resumes its activity.

Hill and Taylor<sup>10</sup> have shown that a frog's heart immersed in Ringer's solution and placed in the H. F. field is affected in an exactly similar way as when warmed.

However, Laubry<sup>11</sup> *et al.* have studied the effect of short waves on the isolated heart of the rabbit. They claim that the wavelength used plays an important role. They state that no effect is produced with 20 m. but with 3 m. wavelength an acceleration of the rhythm and an increase in the excursions are obtained, and that the feeble intensity of the field does not allow any heat effect. We thought it expedient therefore to repeat our experiment of the frog's heart using the isolated organ. In order to get a sufficiently weak current to apply to the heart, we used 2 platinum wires connected to a short length of cable. Since we could get quite sufficient energy for our needs by this method we did not use a tuned circuit. We carefully placed these two electrodes on either side of the sino-auricular junction. When the H. F. current was switched on with gradually increasing intensity, a point was reached when the heart beat increased in rapidity.

If now while the heart is beating more rapidly due to the H. F. current it is bathed with Ringer's solution at room temperature the heart beats slow down to normal (fig. 7). If now instead of cooling, it is allowed to go on beating fast, the beats become faster and faster and reach a maximum speed; after this the heart stops beating, as it does after application of a Stannius ligature. If now the current is switched off the heart starts beating again after an interval with great rapidity and gradually slows up to normal speed. This recovery is also brought about by cooling with Ringer's solution (fig. 8). If when the Stannius condition is obtained the H. F. cur-

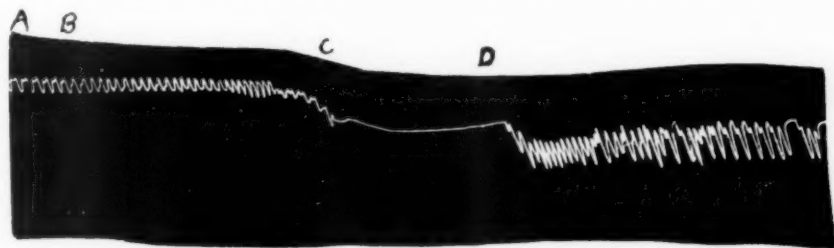


Fig. 8.

Fig. 8. — Stannius condition produced by H. F. current. A — B, normal contraction; H. F. current switched on at B. C — D, Stannius condition. At D, nerve cooled with Ringer's solution.

rent is allowed to go on for some time the heart beat does not return on switching off but the ventricle responds to excitation with single contractions (fig. 9). The whole of this action of H. F. currents on the heart is

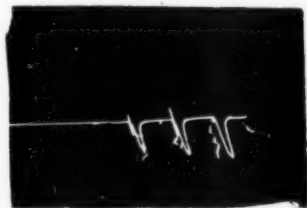


Fig. 9.

Fig. 9. — If the H. F. current is left on during Stannius condition, permanent damage is produced and contractions are only returned on excitation of the ventricle.

exactly as one would expect if it were a heat effect. The effects can be produced equally by a heated platinum loop placed around the sino-auricular junction. With H. F. currents the effects described take place at wavelengths of 600 to 6 m. In the case of the results of Pflumm mentioned above, one would imagine that he has used too high a field strength and missed the increased rapidity of heart beat associated with a small rise in temperature. In the case of Laubry, *et al.* it would appear to us that with 3 m. and 20 m. waves of equal intensity much more heating would be produced by the 3 m. wavelength, thus giving an explanation of these authors' results.

### Summary

The effect of high frequency currents on isolated frog's heart have been investigated. All the effects shown are capable of being explained as a true temperature effect.

(Concluded on page 300)

## ELECTROCHOLECYSTOCAUSIS \*

LESTER R. WHITAKER, M.D., F.A.C.S.

BOSTON

The acutely inflamed gallbladder presents a problem fraught with difficulty for the surgeon and danger to the patient. Heretofore the accepted method in dealing with such a case has been to allow time for the inflammation to subside and the gallbladder to become walled off by adhesions, after which it is drained or removed according to circumstances. Recent study<sup>1</sup> indicates that this is perhaps still the best method in a large majority of cases. Some surgeons, however, are practicing early removal of the acutely inflamed gallbladder with excellent results. It seems to me that expectant treatment, with administration of glucose and fluids should be given for a number of hours; if the patient soon begins to improve, and continues to do so, the inflammation should be given time to subside. After this, without too much delay on account of the probability of recurrent attacks, cholecystectomy should be performed.

The reason why the danger of rupture in the acutely inflamed gallbladder is less than in the appendix is the presence of considerable fibro-elastic tissue in the wall of the vesicle. If an impacted stone in the cystic duct, which is usually the exciting cause, shuts off the circulation to a sufficient degree, gangrene and rupture of the viscus may occur before walling off adhesions have been built up. If, then, after a number of hours of expectant treatment, a spread of the infection or decline in the patient is noticed, surgical methods should be adopted without delay.

The simplest and safest procedure in the poor-risk patient is drainage of the gallbladder under novocain. If the gallbladder is palpable, which often means it is directly under the abdominal wall, this can be done with slight disturbance of the patient. In the case of fulminating, septic cholecystitis, the old rule, "where there is pus evacuate," is still a good one. Often, however, the primary cause is not a virulent infection but an inflammation due to disturbance of the circulation from blockage of the cystic duct.<sup>2</sup> The reaction is comparatively mild, and for this reason it usually subsides under expectant treatment, especially if the blockage of the duct is released, enabling the cavity to drain.

It may be found at operation that, although clinical symptoms have subsided, the gallbladder and tissues about it are still markedly congested and edematous, rendering ordinary dissection for cholecystectomy difficult and dangerous. There are cases where acute attacks are repeated so frequently that the inflammatory condition cannot resolve. The conservative treatment in these cases is simple drainage of the gallbladder. If a stone remains impacted in the cystic duct, however, there will be a permanent sinus, more or less infected, and subsequent cholecystectomy will have to be performed under this disadvantage.

### Methods of Cauterization of Gallbladder

Pribram in 1928<sup>3</sup> made a definite forward step in the surgical treatment of acute cholecystitis. The gallbladder was split, evacuated, and the mucosa charred with the Paquelin cautery — a procedure he termed "Mukok-lase," which led to the eventual obliteration of the gallbladder and avoided

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the danger of hemorrhage. Soon afterward (1929) Pribram began to use electrosurgical diathermy instead of the hot iron.<sup>4</sup>

In 1930,<sup>5</sup> I began to experiment with a modification of Pribram's method consisting in trimming away redundant portions of the gallbladder with the cutting current, and electrocoagulating the part remaining attached to the liver. The cystic duct was either tied or drained with a tube.

One advantage of these methods is that hemorrhage is readily controlled; another is that the gallbladder is split to the cystic duct, and perhaps even through to the common duct, in order to discover and remove an obstructing stone. With ordinary methods of dissection the cystic duct is very likely to be tied high, and a stone in it overlooked. This will lead to failure in almost every such case, either with a permanent sinus, or with a dilatation of the remnant of cystic duct above the stone as a miniature gallbladder; and a recurrence of symptoms.

There are cases where even the comparatively safe electrosurgical procedure just described is more than should be attempted, particularly with acute, fulminating cholecystitis, or empyema. In these cases, however, it would be highly gratifying if the gallbladder at the time it was drained could be treated in such a manner as to result in obliteration, thus eliminating the need of a second operation.

For several years I have been concerned with the problem of obliterating the gallbladder at the time of drainage. If the mucous membrane has been entirely destroyed by the inflammatory process, the cavity may be packed and allowed to heal by sclerosis like any sinus. The difficulty here is that the mucous membrane is highly resistant, and if even a small amount is left it may regenerate to form a miniature gallbladder or a permanent sinus. This explains why early experimental attempts with dogs to destroy the gallbladder by mechanical and chemical treatment of the mucosa were unsuccessful.

With one patient having gallstones, who was a poor risk, efforts were made to obliterate the gallbladder through destruction of the mucosa by mechanical and chemical means. At different times curettage followed by formalin (10 per cent); or the application of phenol and alcohol; or alcohol alone, were used. All were unsuccessful. Though the patient suffered practically no disturbance from these operations, bile drainage continued until she died four months later from a rapidly growing carcinoma of the colon with metastases. At post-mortem the gallbladder was found to be small, the wall moderately thickened; but the mucosa was smooth and glistening, and apparently normal. This case illustrates the great difficulty of destroying the mucosa of the gallbladder by chemical means.

However, "chemical cholecystectomy" has been successfully performed by Gatch.<sup>6</sup> The gallbladder is split to the cystic duct and trimmed away, leaving a narrow margin at the attachment to the liver for suturing. The cystic duct is tied if it can be safely dissected, otherwise a tube is placed in it. The mucosa of the gallbladder left attached to the liver is treated with pure carbolic acid on a sponge wrung dry, followed by alcohol. The cut edges of the gallbladder are whipped over the tube with fine, plain catgut. If the cystic duct is tied the tube is placed just proximal to it and covered by the suturing. Penrose drains are used, protected by intra-abdominal fat. The method is of advantage with the gangrenous or acutely inflamed or the sclerotic, adherent gallbladder. It is easy to carry out, and reduces the danger from shock and hemorrhage. There is no postoperative drainage of bile if the cystic duct can be tied.

Gatch had excellent results in 54 patients upon whom the operation was performed. A rapid postoperative recovery was the rule. One patient

died of acute heart failure four days after the operation, and one other, after leaving the hospital, with convulsions from toxemia of pregnancy. Gatch gives the credit for originating "chemical cholecystectomy" to Martin of New Orleans (1921) who used tincture of iodine instead of carbolic acid.

This is essentially the same method which I now term electrocholecystectomy with the use of surgical diathermy instead of chemicals for treatment of the mucosa.<sup>5-7-8-9-10-11</sup> With electrocoagulation properly applied destruction of the mucosa is more effective.

The following case illustrates the uncertainty of phenol by this method:

While operating upon an acutely inflamed gallbladder with an unfamiliar electro-surgical unit, the coagulating current proved to be too weak for tissue destruction. After trimming the rest away a small funnel of gallbladder had been left just above the cystic duct. Further dissection would have been too dangerous. Phenol was applied twice, with an interval of five minutes, and left on the mucosa. The mucosa, however, regenerated with formation of a miniature gallbladder and a permanent sinus.

With the poor-risk patient having a markedly inflamed or gangrenous gallbladder, swelled and easily accessible, it might be worth while to cauterize the inside of the viscus with phenol at the time of drainage. The whole operation could in many cases be carried out through a small incision in the abdominal wall and a comparatively large incision in the fundus of the gallbladder. Using a focusing headlight, ribbon retractors and an aspirator, the inside of the gallbladder could be thoroughly treated. If this resulted in obliteration of the viscus, a second operation would be avoided. The procedure could be called *chemocholecystocauterization* (cauterization). Unless the mucosa were considerably damaged by disease, however, complete destruction by the phenol would be doubtful.

The advantages of this method would be: Ease of execution, decreased risk, and expectation of removal of the gallbladder where only cholecystostomy could be safely performed otherwise.

Experience with chemicals, however, has led me to direct my efforts to the use of electrosurgery as a method more easily controlled and promising results of greater certainty in the type of case under discussion. The electrocauterization of the mucosa of the gallbladder through an opening in the fundus, as for drainage, can be termed *electrocholecystocauterization*.<sup>12</sup>

### Experimental Methods

Method I — *Preliminary Operation*. — The cystic duct is blocked, partially or completely, with silk or silver wire or damaged by crushing. The cystic artery may or may not be included. The gallbladder is damaged by clamping, or by the application of carbolic acid, or both; and the fundus is stitched with silk into the upper end of the abdominal wound. This is to create a situation comparable to that in the patient with an acutely inflamed gallbladder, adherent or in contact with the abdominal wall, easily accessible.

The dog is then allowed to go for two to five days, until the inflammatory process is well advanced. Then, under morphin and ether anesthesia, the upper end of the abdominal wound is opened, the fundus of the gallbladder exposed, a small opening made, the contents aspirated, and the opening in the fundus dilated by pressure to the full size of the lumen of the gallbladder. If the peritoneal cavity is not protected by adhesions it should be walled off with gauze. The bladder is cleared by suction; if bile wells up a small plug of gauze may be packed into the outlet. Then, using a focusing headlight and a bivalve retractor with long blades, which should be insulated, the whole interior of the gallbladder is carefully treated.

The biterminal coagulating current should be used, with both fulguration and light contact coagulation. The destruction of the mucosa must be thorough, and yet the coagulation must not be deep enough, especially near the duct, to penetrate the wall of the gallbladder and damage adjacent viscera, or result in leakage of bile into the abdomen. For this reason, only the gallbladder with thickened walls should be treated by this method. Only surface fulguration, and not deep coagulation, must be employed. None but the

\* This, too, is a modification of Pribram's method of "Mukoklasis."<sup>3-4</sup>



lightest contact of the needle with the mucosa should be allowed and it should not rest long in one place. The mucosa must be thoroughly charred by the fulgurating spark. Generation of excessive degrees of heat can be avoided by short intervals or rest. The deep folds must be straightened out to be sure that no part of the mucosa is left untreated. If these conditions are observed there appears to be little danger.

With dogs a soft rubber tube of fairly large caliber is then placed lightly in the gallbladder and attached at the top, where the gallbladder is closed around it. This method is used because of greater convenience with dogs. With patients it would be preferable to leave a wide opening, and pack several Penrose drains, with no gauze exposed, into the cavity.

*Protocols:* Dog 1. — Operation June 16, 1935. Performed as described. The tube was removed after four days. The wound was healing by granulation at the end of two weeks, with slight discharge of bile. The animal was then killed. Autopsy showed no peritonitis. There were pronounced adhesions of omentum and viscera about the site of operation. However, a miniature gallbladder about 4 cm. long and 1.5 cm. in diameter had reformed. This was due undoubtedly to insufficient destruction of the mucosa or because the fulguration was not carried close enough to the cystic duct.

Dog 2. — Gallbladder damaged at a preliminary operation by clamping and application of phenol, and attached to the abdominal wall under the incision. The second operation, after five days, was similar to that in Dog 1 except that the fulguration was more prolonged and thorough, the needle making light contact with the mucosa. Tube was removed after four days. Bile drainage then ceased and the wound began to heal by granulation. On account of failure to obliterate the gallbladder in the previous experiment it was decided to explore the sinus and, if necessary, treat any remaining mucosa of the gallbladder. None was found. The sinus closed by granulation. Autopsy seven months afterward showed the wound solidly healed. There were dense adhesions of the duodenum to the gallbladder fossa, the only case where this occurred. The gallbladder had been obliterated and the ducts were normal.

Dog 3. — First and second operation the same as in Dog 2. During fulguration of the gallbladder at the second operation there was considerable short-circuiting to the metal blades of the retractor, and when the process was complete it was found that the gallbladder had been perforated anteriorly. A tube was placed inside the gallbladder; but the dog died after about twenty hours. Autopsy showed peritonitis. The gallbladder was thickened to 2 or 3 mm. and appeared necrotic. The lesson here is that contact electrocoagulation deep enough to result in perforation of the gallbladder must be avoided. If this should occur with a patient, of course, the thing to do would be to perform regular electrocholecystectomy, trimming away redundant parts of the gallbladder, coagulating the rest, and placing a tube in the cystic duct.<sup>8-10</sup>

Dog 4. — First and second operation as in Dog 2, with an interval of four days between. Moderate yet thorough fulguration of the inside of the gallbladder, with some light, rapid contact of the needle with the mucosa. At the second operation the peritoneal cavity was opened slightly, but packed with gauze to prevent excessive contamination. There was moderate postoperative bile drainage through the tube, which was removed the fourth day. One week after the operation the animal was in excellent condition; there was a fairly profuse discharge of bile-stained mucus from the open wound, which was healing by granulation. The sinus closed, and the dog remained in excellent condition for six months, when he escaped.

Dog 5. — At the first operation the gallbladder was damaged, the cystic duct tied, and the fundus stitched into the abdominal wound. Four days later the fundus was opened and the mucosa fulgurated. The dog made a good recovery but the sinus discharged mucoid material (fig. 1, A). The vesicle could have been obliterated easily by a second fulguration through the sinus.

Dog 6. — First and second operations as described above. Fulguration of the mucosa was rather light. Autopsy after one month showed the sinus apparently closed, but a little dissection opened into a shrunken, thickened gallbladder containing about 3 cc. of mucus. There were light adhesions of the omentum to the gallbladder fossa and liver (fig. 1, B). In this case there had been insufficient coagulation of the mucosa. A dilatation of the sinus and second electrocoagulation would have obliterated the gallbladder.

*Method II* — This differs from Method I in that the gallbladder is not stitched to the abdominal wall after being damaged at the preliminary operation, but is allowed to fall back to correspond to the condition in a patient where an acutely inflamed gallbladder might be rather deeply placed.

Dog 7. — At a preliminary operation the cystic duct was dissected high up, and a silk ligature placed around it and the cystic artery. The gallbladder was damaged by clamping, and replaced. At a second operation, three days after the first, the wound was opened at the upper end into the peritoneal cavity. The gallbladder was buried in

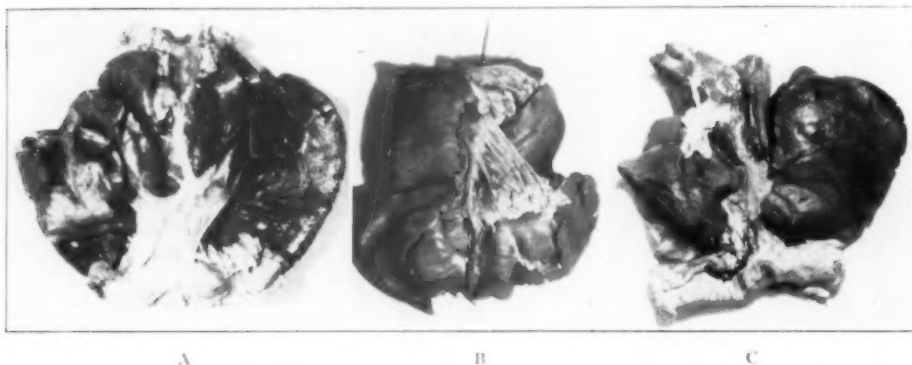


Fig. 1. — *A*, Regeneration of gallbladder after insufficient cauterization of mucosa. Showing under-surface of liver with gallbladder above (arrows) sutured to the abdominal wall. A second cauterization through the sinus would have obliterated this gallbladder. *B*, Permanent sinus from insufficient cauterization of mucosa. Probe in sinus. Section of abdominal wall above. Omental adhesions walling off the sinus. *C*, Absence of gallbladder after cholecystocauterization.\* Under-surface of liver. Tab of omental adhesions (above) to original site of gallbladder. Common-bile duct (center) slightly dilated as is usual after cholecystectomy.

adhesions, acutely inflamed and thickened, but not necrotic. The adhesions were freed. The fundus was grasped with a clamp and pulled up to the abdominal wound. The peritoneal cavity was packed off with gauze. Then the fundus of the gallbladder was stitched into the wound on both sides with interrupted silk sutures. The fundus was opened and the contents emptied. By means of retractors and focusing headlight the closed outlet of the gallbladder could be easily seen. The mucosa there was fulgurated lightly, with care not to overdo it and run the danger of perforation. Most of the remaining mucosa was charred by fulguration. A tube was placed in the gallbladder, fixed at the top, and the wound closed by through-and-through silk sutures.

The dog made an excellent postoperative recovery. Autopsy after four months showed the wound solidly healed; sinus closed; gallbladder obliterated. There were only a few light omental adhesions to the gallbladder fossa (fig. 1, *C*).

Dog 8. — In this animal a modification of Method II was carried out. Electrocholecystocauterization was applied directly to the normal gallbladder. The fundus was opened and held by guy sutures. The mucosa was then treated by light fulguration and contact coagulation, covering the whole surface thoroughly, and taking some time. The serosa was observed occasionally to make sure the coagulation did not extend through the gallbladder wall. The cystic duct was not tied. A tube was placed in the gallbladder which was tied around the top, and the abdominal wound closed. The tube sloughed away after five days. After five weeks the wound had healed. Autopsy six weeks after the operation revealed an excellent result, the gallbladder having been obliterated. This shows that electrocholecystocauterization can be used on the normal gallbladder, though great caution is required to avoid perforation. This experiment was performed simply to show that the method is safe enough with a thickened gallbladder.

Dog 9. — Almost exactly the same procedure as in Dog 8 was carried out with perhaps a little more thorough fulguration of the mucosa. A small plug of gauze was placed in the cystic duct to prevent the mucosa from becoming wetted while this was going on. The wound was apparently healed at the end of three weeks and the dog remained in excellent health for two months, when he escaped.

Dog 10. — The same operation was performed as in Dog 8. The tube sloughed out in about a week. After ten days the wound was reopened for investigative purposes. There was a small collection of sero-purulent material in the vicinity of the gallbladder which was shrunken, thickened and flattened. It was opened and split half way down. The mucosa was fulgurated and a catheter placed in the gallbladder. After three weeks the wound had healed, and the dog remained in excellent condition for seven months. Autopsy showed the wound solidly healed. There was a light tab of omental adhesions to the gallbladder fossa. Also light adhesions of the fat of the gastrohepatic omentum to the gallbladder fossa, pulling up the duodenum slightly. The gallbladder had been obliterated, only a small fibrous sheet of tissue remaining. The common and cystic ducts were moderately dilated, which often occurs after cholecystectomy. This experiment shows that, if the gallbladder is not obliterated at the first fulguration, a second can be carried out safely and successfully, even in the presence of a certain amount of local infection.

\* For this term the writer is indebted to Paul J. McManus, S. J.

### Summary of Experimental Results

In four of ten dogs coagulation of the mucosa was insufficient, and it regenerated somewhat (fig. 1, *A* and *B*). In one of these dogs a second coagulation obliterated the mucosa, and with it the gallbladder (fig. 1, *C*). The same could have been done easily, through the sinus, with the other three dogs.

With one dog coagulation was too deep, resulting in perforation and peritonitis. After a little practice with the machine (even on raw beef) this is avoidable. *Biterminal fulguration and light contact coagulation only must be used.*

Two dogs having apparently good end results (animal healthy and wound solid) escaped, so no autopsy could be performed.

In three dogs the results were satisfactory.

*Clinical Trials.* — A woman of sixty-eight, had had a cholecystotomy, with removal of stones, eight years previously. For two months she had complained of extreme tenderness in the upper abdomen to the right of the midline. A mass was palpable here, about the size of a goose egg, just median to the old incision. The history, the discovery of a mass, and a leukocyte count of 17,000 per cu. mm. without evidence of acute general reaction, warranted the diagnosis of empyema of the gallbladder. Since it was felt that the patient would probably not survive a radical operation, cholecystostomy was decided upon.

Under novocain analgesia a small incision was made directly over the palpable mass. Upon section of the fascia of the abdominal wall pus exuded, and about four ounces were removed by aspiration. (Culture showed streptococcus viridans.) The finger was inserted along the course of a sinus extending outward and upward under the old scar. This tract was carefully expanded by pressure, since it was believed to be walled off by inflammatory adhesions. Finally a small cavity was entered. With ribbon retractors and focusing headlight the typical mucosa of the gallbladder in fair state of preservation, despite the empyema, was outlined. No bile could be observed coming through the cystic duct. No stones were found. Since a second cholecystostomy probably would have led to a repetition of the process, it was decided to attempt obliteration of this gallbladder by electrosurgery. Holding the bladder open with ribbon retractors the whole inside was thoroughly fulgurated with the biterminal coagulating current. Since a superficial action was desired for obliteration of the mucosa without perforation of the gallbladder, fulguration was preferable to deep coagulation. The only danger in the process so far as could be seen was damage to adjacent structures in case of perforation. Since fulguration is simple, and its extent is indicated by the degree of charring of the surface, it seemed the safest procedure here. This process was carried out without a great deal of difficulty. Three Penrose drains with no exposed gauze were inserted, one in the bottom of the cavity and two slightly retracted. Only hypnotics and novocain were used for analgesia. The patient moaned a little when there was considerable pulling on the deep retractors, or when the fulguration was carried on for any length of time, generating considerable heat. She stood the operation remarkably well, and made a surprisingly rapid recovery. She felt better the second day after the operation than before it. There was a moderate sanguino-purulent discharge from the drainage tract. There was no nausea, distention, or fever. The patient was taking fluids freely. The third day she had a bowel movement from mineral oil given the day before. One of the three drains was removed on the third day and another on the eleventh day. The sinus discharged muco-purulent material for three weeks after the operation. Then it was felt that the destruction of the mucosa could not have been complete. Since apparently this operative procedure carried very little risk a repetition of it through the sinus tract was undertaken.

The second operation was performed under novocain, nitrous oxide-oxygen, and light ether anesthesia. The outer end of the sinus tract was opened widely. The forefinger could be put into the old sinus and readily reached its bottom. Inspection with the headlight showed no visible mucosa of the gallbladder. With the intention of thoroughness, however, continued probing with the finger opened into a cavity out of which came bile. This was thought to be another section of the gallbladder, such as might occur in an hour-glass type, which had been untouched by the first coagulation. But the edges of this opening everted, and showed rugae characteristic of the stomach. The finger was placed inside the cavity, extending toward the pylorus. Small nodular masses were felt, the nature of which could not be made out, but were thought to be possibly carcinomatous. The opening in the stomach was roughly closed with a continuous lock-

stitch and the outlet of the abdominal wound marrowed by one through and through silkworm gut stitch. Penrose drains were used. The lesson to be learned from this case is to wait longer to see if the sinus will close before reoperation. The first treatment had obliterated the gallbladder. The sinus was simply slow in closing.

After the second operation, the sinus still failed to heal. A moderate amount of stomach contents was discharged, although the patient's nutrition was well maintained. She began to run an unexplained fever, and complained of pain in the right hip posteriorly. Examination of the abdomen one month after the operation revealed nothing significant. An x-ray examination of the gastrointestinal tract two months postoperatively showed a narrowing and irregularity at the pyloric end of the stomach where a simultaneous injection of lipiodol through the sinus tract showed a communication. After three months a small nodule typical of metastatic carcinoma was noted at the outlet of the sinus tract. Biopsy showed metastatic adenocarcinoma, grade III.

About this time rectal examination disclosed, high on the right side, a fullness which was very tender. It was thought to be possibly an inflammatory mass associated with the pain in the right hip. The patient ran a septic temperature, and died four and one-half months after the second operation.

Postmortem examination revealed a primary carcinoma of the stomach, with general abdominal carcinomatosis. The gallbladder was absent and in its stead were numerous organized adhesions. The biliary ducts were patent. The stomach showed a large fungating growth, 4 cm. in diameter, elevated from the mucosa so as to occlude completely the pyloric opening. The neoplasm had infiltrated surrounding structures — transverse colon, duodenum, omentum, and abdominal wall, forming a mass about 12 cm. in diameter.

A perirenal abscess was discovered near the lower pole of the right kidney. It contained about 250 cc. of thick, creamy yellowish-green pus. The cavity extended downward toward the right buttock and thigh. (This accounted for the pain in these regions and for the septic temperature, and apparently had no direct connection with the operative site.)

The obliteration of the gallbladder was complete in this case after the first cauterization. Secondary exploration three weeks later on account of slow healing of the sinus was not necessary. There was a complicating carcinoma at the pyloric end of the stomach. If this had not been present it appears that the operation upon the gallbladder would have been successful. The disturbance of the patient at the time of operation was very slight, and the immediate recovery was easy and rapid.

*A second case* in which fulguration of the mucosa of the gallbladder was performed was of a different character. A primary operation for cholecystectomy had to be terminated speedily on account of the poor condition of the patient. The cystic duct had been cut off. An attempt at rapid electrocoagulation of the whole remaining gallbladder was made. The drainage tract persisted. Weeks later a lipiodol injection showed a small sac at the depth of the sinus, three or four cm. in diameter. At reoperation this was approached through a separate abdominal incision, and located by a catheter in the sinus. To avoid the danger of sharp dissection the sac was opened and the lining thoroughly fulgurated. Fulguration was used because of the danger of perforating an adjacent viscus by deeper coagulation. Drainage was instituted. After a few weeks the sinus closed, and remained so, indicating complete destruction of the remnant of gallbladder.

The following is a case previously reported in which electrocholecystocausis might have been preferable to the radical electrocholecystectomy and excision of a sinus tract which was performed:

A sinus had persisted in discharging muco-purulent matter for three years after a cholecystostomy. At operation: "From an elliptical incision dense adhesions about the sinus tract was dissected with sharp instruments. Hemorrhage from the liver was controlled by deep electrocoagulation. The thickened, thumb-sized gallbladder was deep in the abdomen. Upon splitting it longitudinally it was found to contain muco-purulent material and several mulberry gallstones about a centimeter in diameter. The cystic duct had apparently been closed by fibrosis. Some of the gallbladder tissue was cut away with the cutting current, and that left attached to the liver was scooped away with a loop electrode. The gallbladder fossa was treated by electrocoagulation and fulguration. Penrose drains were inserted to the gallbladder fossa."<sup>2</sup> It might have been possible and safe, on account of dense adhesions around the sinus tract, to dilate it and gain access

to the cavity of the gallbladder sufficient to perform internal electrocholecystocausis. Obliteration through this procedure would have avoided the serious operation described above.

### Summary

A method for obliteration of the acutely inflamed gallbladder by electro-surgical cauterization, biterminal, through an opening in the fundus is described.

The experimental procedure in dogs was essentially: (a) Preliminary trauma to the gallbladder resulting in a condition similar to acute cholecystitis in patients. (b) Later, through a direct opening into the fundus of the vesicle, using a focusing headlight and special retractors, the mucous membrane was destroyed by fulguration and surface coagulation — *electrocholecystocausis*. Drains were placed inside the gallbladder, and the sinus allowed to heal by sclerosis.

Experimental results have been good; and limited clinical results, promising.

The advantage over ordinary methods is, that with an operation involving little more trauma than cholecystostomy, the gallbladder is obliterated and a second operation avoided.

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### References

1. Bass, H. L., and Bird, C. E.: Delayed Operation in Acute Cholecystitis. Report of 134 Operations on the Biliary Tract, Covering a Period of Five Years, *Am. J. Surg.* **32**:241 (May) 1936.
2. Denton, J.: Mode of Origin of Gallbladder Lesions, *Arch. Surg.* **14**:1 (Jan.) 1927.
3. Pribram, B. O.: Mukoklase und Drainagelose Gallenchirurgie, *Zentralbl. f. Chir.* **55**:773 (Mar. 31) 1928.
4. ———: Zur Technik der Mukoklase, *Zentralbl. f. Chir.* **56**:1054 (April 27) 1929.
5. Whitaker, L. R.: Surgical Management of Gallbladder Disease, *New England J. Med.* **203**:718 (Oct. 9) 1930.
6. Gatch, W. D.: Chemical Cholecystectomy, *Trans. South. Surg.* **42**:110, 1930.
7. Whitaker, L. R.: Electrosurgical Cholecystectomy. I. Experimental Observations, *New England J. Med.* **213**:596 (Sept. 26) 1935.
8. ———: Electrosurgical Cholecystectomy. II. Clinical Application, *New England J. Med.* **213**:674 (Oct. 3) 1935.
9. ———: Electrocholecystectomy, *New England J. Med.* **214**:35 (Jan. 2) 1936.
10. ———: Electrocholecystectomy, *Rev. Gastro-ent.* **3**:42 (March) 1936.
11. ———: Descriptive Terms for Abdominal Electrosurgery, *Am. J. Surg.* **32**:452 (June) 1936.
12. ———: Electrocholecystocausis. Preliminary Report, *Am. J. Digest Dis. and Nutrition* **3**:62 (March) 1936.

(For discussion please turn to page 281)



## FURTHER EXPERIENCES WITH ELECTROSURGICAL OBLITERATION OF THE GALLBLADDER \*

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About three years ago I began the study of the effects of electrosurgery as related to disease of the gallbladder. I then pointed out<sup>1</sup> that the operative mortality of cholecystectomy by the time honored scalpel method still is too high. (In experienced hands in selected cases about 1 or 2 per cent — in the hands of occasional operators and in patients not considered "good surgical risks" about 10 or 12 per cent or more.) I have also stressed the fact<sup>2</sup> that the reason for this mortality rate is due to the fact that in dissecting the gallbladder from its bed some bile ducts are divided which are present in from 15 to 25 per cent of normal individuals. Obliteration of the space on the under surface of the liver after ablation of the gallbladder is often impossible to accomplish. Drains are, therefore, resorted to which invite bile seepage. Another important factor is that besides the opened gall passages, blood and lymph spaces are left open, creating an atrium readily accessible to infectious microorganisms.

I have recently gone into detail<sup>3</sup> concerning the factors contributing to this high mortality and have suggested possible methods of reducing it.

I wish to point out that if in surgical interventions on the gallbladder its posterior wall is not dissected free from its bed, but left in situ and is there and then converted electrosurgically into an inert, sterile, hyaline-like structure, an important step in reducing mortality may be accomplished. Upon this principle coupled with the observation of Kuntzen and Vogel that electrocoagulated surfaces within the abdomen attract serous surfaces to which they become promptly agglutinated (3 hours after operation), I have evolved an operation (cholecystelectrocoagulectomy) which when meticulously performed will reduce operative mortality.

Up to date (September, 1936) 224\* patients were operated on by my method of electrosurgical obliteration of the gallbladder (202 operations having been performed by myself, 16 cases by Dr. E. L. Kellogg, of New York; 4 cases by Dr. Bliss Finlayson, of Utah, and 2 cases by Dr. Homer S. Warren, Jr., of Chicago). This entire series consisted of unselected cases at all ages, the youngest patient being eighteen and the oldest seventy-four years of age, *without a single death*,\* with the exception of one patient who died a week after the operation from conditions entirely unrelated to the operation (post mortem verification). Those interested in the rationale and evolution of the procedure and the biophysiologic factors underlying it are referred to my previous communications.

\* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 9, 1936.

\* Since reading this paper the number of cases operated on has been augmented to 286 (April, 1937). The causes of deaths were as follows: (1) ruptured undiagnosed chronic subphrenic abscess, 10 days after operation; (2) massive collapse of lung; (3) pneumonia 2 weeks after operation. An analysis of these three deaths cannot be ascribed to the operation *per se*; nevertheless if charged as operative mortality the result would be a little less than one and one-tenth per cent death rate in this series of cases.

### Technic

I attribute the results of my procedure to a thorough appreciation of the factors involved and to the careful observance of details. Some salient points concerning the technic follow:

1. It is well to recall that bile leakage is rare from the cystic duct and extremely common from the unprotected gallbladder bed after classic cholecystectomy.

2. Painstaking pre- and postoperative care is essential.

3. Where a biterminal diathermy apparatus is used the patient must be insulated. Where one resorts to the short wave machine no insulation of the patient is necessary.

4. Spinal analgesia is the method of choice. (My preference is for novocain crystals or neocain.) The patient is placed in the Mayo-Robson position with the lower thorax and upper abdomen elevated. I prefer a straight incision. Complicated incisions should be practiced by those expert in their use. The general surgeon will find a straight paramedian incision beginning at the lower costal margin somewhat to the median line and extending down to opposite and, perhaps, somewhat beyond the umbilicus the simplest and best avenue of approach.

5. After the abdomen is opened, the falciform ligament is completely detached from the posterior surface of the parietal peritoneum of the anterior abdominal wall. In so doing some blood vessels are divided which must be securely ligated. The detached ligament is placed temporarily in a receptacle filled with salt solution. Bleeding vessels at the site of detachment of the ligament must be thoroughly ligated. In my first series of cases I permitted the ligament to remain attached to the abdominal wall by a narrow pedicle. Following this procedure, patients, not infrequently, complained of tugging sensations. Now the ligament is entirely detached and such sensations are no longer complained of.

6. Pack the abdominal viscera out of the way. Good exposure is essential. The stomach is displaced to the left, the small intestines and colon downward and a sponge or two are placed to protect Morisson's pouch against possible contamination. The gallbladder is explored manually. A finger in the foramen of Winslow, when that is patent, will afford information about the presence or absence of stones in the extrahepatic biliary passages, the relative position of the cystic duct, hepatic artery, and the like.

7. Evacuate the gallbladder by means of a trocar. Inject into it some antiseptic solution (S. T. 37, dil. iodine, etc.). Bile contains only about 5 per cent of microorganisms while about 70 per cent of the structure of the gallbladder-wall harbors infectious germs.

8. Ligate the cystic duct together with the cystic artery, doubly. Cut the ligatures short. Place a curved duct clamp on the cystic duct above the proximal ligature and detach the gallbladder from the duct by means of a pair of curved scissors. Where there is reason to believe that the ducts contain stones or where exploration is indicated, split the gallbladder in the midline from its fundus down to Hartman's pouch and explore the ducts with flexible sounds through the cystic duct stoma. After that is accomplished, ligate the cysticus as outlined above. Some surgeons (Lahey) explore the common duct routinely. Others condemn the procedure as carrying a mortality of about 7 per cent. I never explore the common duct unless the presence of stone is suspected.

9. After opening the gallbladder, evacuate its contents into a specially constructed bile receptacle. Dry the mucous membrane with sterile sponges. Grasp half of the gallbladder with a rubber covered pair of 6 or 8-inch artery forceps;

closing the forceps crushes the gallbladder wall. With a pair of scissors, cut off the redundant gallbladder wall close to but not flush with the rubber covered forceps. Electrocoagulate the gallbladder wall in the grasp of the forceps by applying firmly a small electrode. When this is accomplished, release the forceps; a crushed, coagulated ribbon of tissue remains. Repeat the procedure on the other half of the gallbladder. All that remains now is the posterior gallbladder wall attached to the bed surmounted by the ribbons of electrocoagulated tissue, representing the borders of the gallbladder abutting its bed. The posterior wall of the viscus is now electrocoagulated. In so doing, the following factors are of utmost importance: The aim is *coagulation and not fulguration*. Fulguration creates carbonization which prevents further penetration of the current. I have shown elsewhere that fulguration of the mucous membrane of the gallbladder does not destroy disease lurking in the Rokitansky-Aschoff sinuses. Thorough coagulation is therefore essential. Firm application of the electrode to the surface to be acted upon is a *sine qua non*. The slightest separation of the electrode from the surface creates a dielectricum and carbonization results, frustrating the aim of the operation.

10. When this step of the operation has been accomplished, approximate the electrocoagulated borders of the now hyalinized posterior wall of the gallbladder by continuous or interrupted catgut sutures (No. 0 to 1). Do not permit the needle carrying the catgut to enter the liver tissue. Only electrocoagulated gallbladder margin is picked up and approximated.

11. The bed of the gallbladder is now represented by a line of sutures approximating the borders of the electrocoagulated gallbladder wall. Kuntzen and Vogel having shown that electrocoagulated surfaces within the abdomen develop chemotaxis to serous surfaces, the previously detached falciform ligament is now brought forward from the receptacle and sutured over the electrocoagulated gallbladder bed. To accomplish this, only two sutures are required — one above and one below. This completes the operation.

12. No drains are used. It has been pointed out by competent observers that drains are inimical to electrocoagulated areas. Retractors and sponges are now removed. The elevator on the operating table is lowered and the abdomen is closed in layers.

I am often asked about sloughing. It has been shown time and again that electrocoagulated surfaces within the abdomen never slough unless a drain is introduced. Without drains and with an abdomen securely closed, the tendency is to encapsulation and final absorption. Thus, one must not confuse electrocoagulation within the abdomen with coagulation in other parts of the body such as the nares, throat, or cervix uteri.

The procedure outlined above will succeed in the hands of sincere workers who understand the underlying principles. The tyro or the inexperienced cannot expect results obtained by serious workers. In speaking of electrosurgical resection of the prostate J. McCarthy recalls that it is not a "procedure for amateurs" or to be practiced as "a hobby." The same applies to electrosurgical obliteration of the gallbladder. It exacts careful technic and meticulous attention to detail.

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#### References

1. Thorek, Max: Electrosurgical Obliteration of Gallbladder, J. A. M. A. **103**: 169 (July 21) 1934.
2. ———: Electrosurgical Obliteration of Gallbladder, Arch. Phys. Therap., X-Ray, Rad. **16**:207 (April) 1935.
3. ———: Electrosurgical Obliteration of Gallbladder Without Drainage as Means of Reducing Mortality; Report of 201 Consecutive Unselected Cases, Am. J. Surg. **32**:417 (June) 1936.

Discussions of Papers of Drs. Lester Whitaker, Max Thorek  
and Henry A. Rafsky \*

**Dr. Robert Zollinger** (Boston): I think we all agree that it is both stimulating and refreshing to hear so many new ideas regarding such an old subject as biliary disease. My remarks, however, must necessarily be limited to a discussion of the surgical aspects of these papers, as we have not had experience with diathermy in the Peter Bent Brigham Hospital. Dr. Rafsky's results certainly indicate that, as surgeons, we might well consider this treatment for those patients who present contraindications to operation.

Dr. Whitaker has presented a possible solution to the problem of secondary operation after cholecystostomy for acute cholecystitis. Although with our conservative management we seldom find it necessary to perform a cholecystostomy, it is well accepted that subsequent cholecystectomy is almost inevitable if permanent clinical cure is to be effected. If we are able to avoid this second operation by following Dr. Whitaker's method an important step forward has been made in the treatment of acute gallbladder disease. His experimental data are impressive and certainly warrant extensive clinical trial.

Although the Peter Bent Brigham Hospital was among the first to employ high frequency currents, particularly in the surgical treatment of intracranial tumors, we have not used it to any great extent in general surgery. Since Dr. Thorek, by using this type of electricity in general surgery, has achieved an extraordinarily low mortality rate it behooves us to analyze our methods and results in comparison with his. In teaching cholecystectomy to our house staff, we call attention to the careful isolation of the cystic duct and artery. These structures, whenever possible, are tied individually with fine silk. Particular attention is given to meticulous dry closure of the liver bed with fine interrupted silk sutures. When such approximation of the liver bed can be carried out the abdomen is closed without drainage. During the past one and one-half years we have not drained about 30 per cent of our cases. However, we believe drainage should be instituted whenever induration makes definition and ligation of the cystic duct and artery difficult, or whenever a raw liver bed exists, or when purulent infection is encountered. Dr. Thorek's method could be used to advantage in those cases in which we ordinarily find it easier and safer to remove the gallbladder from the fundus toward the ampulla.

Our mortality for all types of operations on the gallbladder and bile ducts for cholelithiasis and cholecystitis, performed by members of the house and senior staff, for 1933 and 1934, was 7.1 per cent. For the past eighteen months we have been draining fewer cases and

our mortality for 113 cases has been 1.7 per cent. I would emphasize that we explored the common duct in 40 per cent of the cases during this three and one-half year period, which of necessity are drained at least to the extent of a catheter in the common duct. We have recovered calculi from the common duct in 22 per cent of the whole group. I believe this is a permissible mortality comparison when one considers that many of the cases were done by the house staff, and unlike Dr. Thorek's series includes such a large group of common duct stone cases. It is well accepted that the mortality rate is the highest in the latter group. Time does not permit a detailed analysis of the 13 deaths during the three and one-half year period. However, a common duct stone was recovered in five of the cases and the age of eight patients ranged from 60 to 76 years. Pulmonary embolism and infection were the most common causes of death. Although 12 of the 13 fatal cases had been drained, I doubt if a change in technic would have materially improved the results in this group. We have profited by the teaching of less frequent drainage in appendicitis. Likewise, Dr. Thorek has shown the futility of promiscuous drainage after cholecystectomy. I believe that in the future our tendency will be to drain fewer cases.

**Dr. Gustavus M. Blech** (Chicago): In this symposium on biliary disease Dr. Rafsky exhibited the value of medical diathermy and non-surgical drainage of the gallbladder in a manner which clearly shows that cholecystitis is not necessarily always a surgical disease. The fact is that we see quite often patients with all the earmarks of acute biliary infection, who get well after one sharp attack that has been checked by external heat, or, as I prefer it, by external cold.

So far as the electrosurgical aspect of this problem is concerned, I would state that in a monograph on electrosurgery soon to be published, I have taken a definite stand on the indications of electrosurgery in general and of electrosurgery of the biliary apparatus in particular, and that is that I see no good reason for attempts made both here and abroad to substitute electrosurgical for classic techniques without an imperative indication. We are agreed that the ideal operation for the removal of the gallbladder is by subserous enucleation, but unfortunately only a limited percentage of the cases we see lends itself to this procedure. That classic cholecystectomy is not always satisfactory is evidenced by the constant search for new and better methods, and no wonder, for after all biliary surgery is only about fifty years old and it had to pass the usual childhood diseases, such as extensive drainage after huge and multitudinous incisions, of excessive length, to say nothing of Kocher's enthusiasm for cho-

\* This paper was published in the April issue of the ARCHIVES, p. 214—Ed.

lecycotomy followed by suture of the gallbladder wound. All this led to attempts of obliterating the gallbladder by some type of cauterization.

Since English surgeons have credited Rutherford Morison as being the originator of the idea of destroying the secreting part of the mucous membrane by either the thermocautery or, as they call it, the diathermy button, I have gone into a thorough search of the literature for which I utilized the unexcelled resources of the Army Medical Library, and I agree with Dr. Whitaker that the credit for the idea is Pribram's, of Berlin. He was the first to use an actual cautery, but as early as 1929 substituted for it the high frequency current. And while Pribram has at first fulgurated for the purpose of carbonization, or in German "Verkohlung," his latest publication shows that he has changed to the use of the loop electrode with which he practices electrocoagulation, or "Verkohlung," terms which signify charring and cooking, respectively. But no matter which modification one may use, let us not overlook that electrosurgery is rough surgery, that is, really fine anatomic dissection cannot be attained and under the circumstances malignancies, infections and hemorrhagic diatheses constitute the essential indications for electrosurgery, also in biliary diseases. I am therefore unable to agree with the dogma that all cases of cholecystitis should be treated electrosurgically.

Technically, I think I can say that I have reduced if not prevented postoperative seepage of bile by ligating the cystic duct with silk without undue pressure. I have seen sloughs necessitating reopening of the abdominal wound in two cases at the hands of novices. This leads up to the question of drainage. As I have already stated, we have passed the infant stage of bulky drainage, and now the cry is in the opposite direction, of no drainage at all. Just as I think scientific surgeons should avoid popular fetishes, so no rigid rule can be laid down about drainage. No one can tell in advance the degree of infection one will encounter when opening the peritoneal cavity, and so it will be at the conclusion of any biliary operation that each surgeon will have to decide whether a grave infection does not justify the insertion of a small drain. In such cases I close the original wound completely and lead the drain out

through a neighboring stab wound. I wish I could speak of no mortality. For a while I began to believe that with Pribram's method even grave infections can be controlled, until a woman died within 40 hours after electrocholecystectomy from cholemia in spite of all efforts. And I am not sure that any method will prove a safeguard against embolism. Such unavoidable tragedies every surgeon of even the greatest degree of skill will occasionally experience in spite of the rapid strides made by modern surgery.

**Dr. Lester R. Whitaker** (closing): I would like to emphasize again one opinion, that is, if the thin wall gallbladder can be dissected mainly by the ordinary method, that is, by all means, preferable.

**Dr. Max Thorek** (closing): Dr. Whitaker in speaking of gallbladder surgery uses the term "perforation." In surgical procedure, this term is unknown. Perforations as a result of pathology in gallbladder disease occur in about 3 per cent of cases. Dr. Zollinger's discussion is interesting. He refers to classical cholecystectomy. In the latter, one should *always* drain. In electrosurgical obliteration of the gallbladder, one should *never* drain. One must recall the difficulties in completely obliterating the gallbladder bed by classical means. This difficulty is obviated in my procedure by leaving the posterior wall of the gallbladder *in situ*, electrocoagulating it together with the gallbladder bed.

Dr. Zollinger reports a mortality of 7 per cent in classical cholecystectomy. If the mortality can be brought to nearly the zero point, by any method, you will agree, it is truly worth while to adopt such a method.

Dr. Blech states that submucous resection of the gallbladder is only possible in 50 per cent of patients. This is correct. Tixier substantiates this view. I regret to disagree with Dr. Blech, however, that leakage comes from the cystic duct. It has been shown conclusively by Bakes, in a series of nearly 400 cases of classical cholecystectomy, where there were no leaks from the cystic ducts, bile was found in the dressings in the vast majority of cases. Bile issues from the gallbladder bed. Leakage from the cystic duct is very rare and occurs only when too much force is used by the ligature thus cutting the duct; or, crushing a much altered duct with artery forceps.

## WESTERN SECTION MEETS

Los Angeles, June 17, 1937

Elsewhere in this issue will be found the complete program of the Western Section of the American Congress of Physical Therapy, which will meet June 17, 1937, in the Los Angeles County Medical Association Building, 1925 Wilshire Boulevard, Los Angeles. This meeting is held in conjunction with the Pacific Physical Therapy Association. For further information write to Dr. Clinton D. Hubbard, Secretary, Huntington Park, Calif.



## A CONSIDERATION OF THE ELLIOTT TREATMENT OF PELVIC INFLAMMATORY DISEASE OF WOMEN \*

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Certain fundamentals in the treatment of infections of the female pelvis have been repeatedly emphasized by physicians who have had a large experience in the treatment of such conditions. In cases of acute pelvic infections, sedation, absolute rest in Fowler's position, and the administration of large amounts of fluids are the essentials of treatment. Aside from drainage of collections of pus, surgical treatment is rarely necessary or advisable in the acute stages. Such supportive measures as blood transfusion may be necessary to increase resistance and combat anemia. When the acute phase of the disease has subsided, in other words, when the natural mechanism of bodily defense against infection has localized the infectious process, one may begin active local treatment. In chronic pelvic infection in which danger of causing extension of the infectious process by local treatment is greatly reduced, local therapy is also employed. One of the oldest forms of local treatment is the application of heat. This causes absorption of the infectious products by producing an increased flow of blood to the affected region and a consequent increase in the number of polymorphonuclear leukocytes in the infected area.

One is concerned here with a particular method of applying heat to those patients who have infection of the pelvic viscera, that is, the Elliott heat regulator machine. This apparatus combines several valuable features, among which are the relatively low initial cost, the low cost of upkeep and operation, and, most important, the simplicity of operation and application of treatment.

In this type of treatment a distensible rubber bag is inserted into the vagina. The bag is then distended by means of water under controlled conditions of temperature and pressure, in order to apply the heat to as much of the pelvis as is possible. The greater the distensibility of the vagina and the greater the amount of distention of the bag, the greater the area that will receive heat; the less the distention, the less the efficiency and value of the treatment, regardless of the amount of temperature that may be applied. The amount of actual pressure necessary to accomplish this distention varies with each patient and frequently in the same case at the time of different treatments. In some cases it is never possible to obtain sufficient distention to secure proper radiation of heat. This form of therapy should not be employed in such cases. In the application of the Elliott treatment to patients sufficient distention of the vagina is of first importance, for no matter what degree of temperature is used the heat is not efficiently applied unless the volume of water in the bag is sufficient to disseminate the heat. One may determine whether there is sufficient distention by noting the pressure recorded on the gauge of the machine and by

\* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 10, 1936.

palpation of the bag through the vaginal introitus, or, better still, through the rectum. This distention is best obtained by filling the bag with water which has a temperature of 110 degrees F., although the optimal temperature will vary in different cases.

The second principle of the treatment consists of the application of heat. Here again no universal rule can be made. A few patients whose vaginas have been sufficiently distended will tolerate a temperature of 130 degrees F. The ideal temperature is that which can be tolerated at a given distention of the vagina and which will permit the maximal application of heat to the pelvic viscera. If these details of temperature and pressure are carefully followed, one has the basis for successful employment of this method. We have observed these factors in the application of more than 4,000 treatments at The Mayo Clinic and are convinced of the soundness of the statement. The average amount of pressure employed by us has been 2.2 pounds and the average temperature of the water has been 127 degrees F.

Vaginal heat treatments may be administered to the pelvic viscera by vaginal, rectal or urethral applicators. We have largely abandoned the latter except in cases of chronic cicatricial urethritis. The results of the treatment of this condition have been reported by Emmett,<sup>1</sup> who found that a material improvement occurred in a large percentage of cases in which the patients were treated in this manner. Gonorrheal urethritis has not responded to this method of treatment sufficiently well to justify its use. The reason for this probably lies in the fact that the site of infection frequently is in the urethral glands or in Skene's glands, which cannot be reached by the heat. Vaginal application of heat will continue to be the choice in the majority of women who have infections in the pelvis.

#### Technic of Insertion of Vaginal Applicator

The collapsed folded bag is lubricated with a water soluble lubricating jelly and inserted into the vagina. With the water at a temperature of 110 degrees F., the pressure is then elevated to attain a complete distention of the bag. The vaginal introitus and neighboring tissues are protected by moistened gauze. Cotton should not be used.

The use of the rectal applicator, particularly in cases of pelvic cellulitis, has been considered elsewhere.<sup>2</sup> This seems to offer a valuable means of treatment in cases with an undistensible vagina, marked fixation of the broad ligaments, and inflammatory lesions which are situated so high in the pelvis that they cannot be reached effectively through the vagina. Because of the dangers of proctitis, this route should not be employed in cases of gonorrheal infection.

#### Technic of Inserting Rectal Applicator

The rectal applicator in use at the present time is a bag which measures 5.5x9.0 cm. when empty. A bag of these dimensions may be distended to fill the lumen of the rectum completely. The bag is folded on its long axis and grasped about 3 cm. from the distal end by smooth curved forceps. The tip of the bag and the anal orifice are lubricated. The bag is then introduced through the sphincter, the forceps are removed and the bag is pushed in with the finger. The base of the applicator must be well above the dentate margin. If this precaution is not taken there will be a desire to expel the bag which will lead to unsatisfactory treatment. Sufficient pressure is employed to give the patient a definite sense of fullness in the rectum. The temperature is maintained between 122 and 125 degrees F. The anal and rectal mucosa should be inspected through a proctoscope before treatment is commenced. Further observation is desirable from time to time

during the course of treatment. We have seen no significant evidence of damage to the mucosa in cases in which this treatment was employed.

#### **Combined Application of Fever Therapy and the Elliott Machine**

We have for some time treated gonorrheal infections with artificial fever in patients who could tolerate this form of therapy. The results have been satisfactory in more than 85 per cent of cases. Elliott treatment as the sole means of employing heat is now used only in those cases in which fever therapy is not tolerated; it virtually always is used in association with the local measures commonly employed. The results are inferior to those obtained with fever therapy or the combination of fever therapy and the Elliott treatment. In cases in which this combined form of heat therapy is employed the number of treatments seems to be materially reduced when compared to the number required when fever therapy alone is employed. When this combined method of treatment is employed, the Elliott bag is inserted into the vagina after the temperature of the patient has reached the level which is to be maintained in the fever cabinet. Treatment is then given for one to three hours, at an average temperature of 122 degrees F. A temperature somewhat lower than that used when the Elliott treatment alone is employed seems desirable, as the general increase in bodily temperature probably lessens the local dissemination of heat and local damage to the vaginal mucosa might result. We are at present administering two fever treatments before adding the Elliott treatment, as any vaginal manipulation should be avoided until the virulence of the organism has been reduced by the first two treatments. Furthermore, it is perhaps well to accustom the patient to fever therapy before adding the extra manipulation necessary for the application of the Elliott treatment. Bierman and Horowitz<sup>3</sup> and others have advocated local heating at the start of the fever treatment and have used the method without apparent difficulty.

One of the principle considerations in the discussion of any form of therapy is the proper selection of patients. As stated previously, for many years it has been an axiom in the treatment of pelvic inflammatory disease of women that no active local treatment should be instituted in the acute stage, with the exception of the drainage of collections of pus. We believe that, on the whole, this axiom is still true. Exceptions are made in cases of postpartum infections and infections which follow abortion, in which the Elliott treatment has seemed to be of benefit. This exception seems allowable because of the fact that all of the genital organs are usually involved in such conditions; hence, one does not need to fear an upward extension such as may be caused, for example, by local treatment of the cervix in acute gonorrheal cervicitis. The patient with an acute process of this nature should be kept in the Fowler position, and ice or heat should be applied to the lower part of the abdomen. Sufficient doses of sedatives should be administered to insure comfort. The diet should be liquid for the first few days, or, if the case is one of marked infection with evidence of pelvic peritonitis, the oral administration of all food and fluids should be discontinued and fluids should be given by the intravenous route. The patient who has a chronic infection of the pelvic viscera is generally a candidate for the Elliott treatment. It must be remembered that time and rest are essential therapeutic adjuncts to the employment of heat. As a rule, the sooner adequate treatment can be instituted after the acute stage has passed, the greater will be the percentage of satisfactory results and the smaller the number of patients who require surgical treatment.

We have divided the cases of chronic infection into two groups: Gonorrheal or specific infections, and infections of nonspecific origin. In the

former group the patients have all received the usual local medical treatment of the urethra and cervix, in addition to the application of heat to the vagina. These patients all had urethritis, cervicitis, and salpingo-oophoritis. The data in the cases of gonorrheal infection are shown in tables 1 and 2. One hundred and seventy-three patients who had chronic pelvic inflammatory disease of nonspecific bacterial origin were treated by the application of heat to the vagina. Of this number, forty-six (26.5 per cent) required surgical treatment (tables 3 and 4).

TABLE 1. — *Chronic Gonorrheal Infection Treated by Elliott Method and Topical Applications*

Total number of patients treated.....	45
Average number of treatments.....	25
Maximal number of treatments.....	48
Minimal number of treatments.....	9
Average duration of period of treatment (in days).....	41
Maximal duration (in one case).....	4 months
Minimal duration .....	3 weeks

TABLE 2. — *Results of the Elliott Treatment and Topical Applications in Forty-Five Cases of Chronic Gonorrheal Infection*

	Cases	
	Number	Per Cent
Patients cured .....	25	55
Residual evidence of salpingo-oophoritis but negative cultures.....	10	22
No improvement .....	5*	11
Incomplete treatment .....	5	11

\* One patient received surgical treatment which resulted in a cure.

TABLE 3. — *Nonspecific Pelvic Inflammatory Disease Treated With Vaginal Applications of Heat*

Total number of patients.....	173
Average number of treatments.....	16
Maximal number of treatments.....	57
Minimal number of treatments.....	7
Average duration of treatment (in days).....	21
Maximal duration of treatment (in two cases).....	4 months
Minimal duration of treatment.....	6 days

TABLE 4. — *Results of Vaginal Applications of Heat in 173 Cases of Nonspecific Pelvic Inflammatory Disease*

	Cases	
	Number	Per Cent
Marked improvement .....	52	30
Moderate improvement .....	48	27.7
Slight improvement .....	17	9.8
No improvement .....	10	5.7
Surgical treatment required.....	46	26.5

It was noted that chronic parametritis or pelvic cellulitis required a longer period of treatment than did chronic salpingo-oophoritis. Patients who had chronic tubo-ovarian abscesses did not respond well to this type of treatment and it was necessary to operate on a large percentage of these patients. Two patients who had proved tuberculosis of the genital tract were treated with this method. They did not improve and surgical treatment was necessary in both instances. There were twenty patients who received vaginal applications of heat postoperatively to aid in the absorption of residual exudate.

The method has been largely discontinued in the treatment of infestation with *Trichomonas vaginalis*. Chronic cervicitis without associated infection of other pelvic viscera as a rule is treated by actual cautery, with excellent results.

Our general program in administering heat by the Elliott method is to give the patient as much treatment per day as can be tolerated and to repeat the treatment daily for about seven days. The duration of the daily treatment will vary from one to three hours, either in intervals or as one continuous procedure. In a small number of cases the treatment has been continued as long as six hours. At the end of a week the pelvis should be re-examined and the findings compared to those present before the treatment was instituted. We believe that treatment for seven to ten days, followed by an interval of rest, with subsequent courses of treatment, if necessary, is productive of the best results. It will usually be noted that the improvement continues during the recess.

There is no doubt of the efficacy of proper administration of heat to the vagina in the presence of infection of the pelvic viscera. Intelligent selection of patients, an understanding of the fundamental principles of the treatment of the disease, cooperation on the part of the patient, and proper administration of heat will lead to good results.

If heat is adequately employed and pelvic discomfort is not allayed, or if improvement in the condition of the pelvis cannot be demonstrated, this type of treatment should be discontinued. Endometriosis may closely simulate a chronic pelvic inflammatory disease; the clinical history and the pelvic findings in this condition usually manifest an accentuation of symptoms as a result of the congestion produced by the application of heat. In the case of an old pelvic infection of long standing, one is more frequently dealing with the results of infection than with an actual infectious process. In such cases very little improvement may take place or improvement will not reach beyond a certain point. This is one of the groups of cases in which surgical treatment is often necessary to secure complete relief. We believe that vaginal applications of heat are often unduly prolonged in such cases. However, it has been amply demonstrated that preoperative applications of heat often lessen the difficulties and extent of the surgical procedure. The employment of this method of treatment also lessens post-operative discomfort and hastens the absorption of residual exudates.

This is a very useful method of administering heat to the pelvic viscera of women. Properly employed, it will accomplish that which may be expected of heat, namely, an increase in the amount of blood delivered to the affected part. This is often sufficient to accomplish a cure. It will not cure all pelvic infections. The employment of a surgical procedure remains a part of the treatment of pelvic inflammatory disease. The number of women who ordinarily would have to be operated on, can be greatly reduced by an understanding of the underlying problems and by adequate care at the time of the initial infection.

### Bibliography

1. Emmett, J. L.: Elliott Treatment of Chronic Urethritis of Women; a Preliminary Report, Proc. Staff Meet. Mayo Clinic, 10:545 (Aug. 28) 1935.
2. Randall, L. M.: Applications of Heat Through Rectum in Treatment of Pelvic Infections of Women, Proc. Staff Meet. Mayo Clinic, 11:174 (Mar. 11) 1936.
3. Bierman, W., and Horowitz, E. A.: Treatment of Gonorrhea in Female by Means of Systemic and Additional Pelvic Healing, J. A. M. A. 104:1797 (May 18) 1935.



### Discussion

**Dr. Frank H. Krusen** (Rochester, Minn.): I am glad the chairman asked me to comment, since it has been a pleasure to work with Dr. Randall who, I believe, has more knowledge of the technic of the application of the Elliott treatment and dangers of its misapplication than anyone in this country. He had followed this work long before I became associated with The Mayo Clinic.

It matters little what device is used to produce this heating effect. However, we do believe that the rubber bag is much more satisfactory than the metallic applicator Warren and his associates have recommended. Warren's contention is that the metallic applicator is a better conductor and that, therefore, heating of the pelvis is more satisfactory. However, a very thin rubber bag can be made to produce heat on the outer surface beyond the limit of the patient's tolerance. It is quite possible to raise the temperature to 130 degrees F. on the surface of the bag and the great advantage of the rubber applicator is that the vagina is distended and a smooth contact is made to the entire surface, which is important for the prevention of surface burns.

Walter Simpson reported that he had attempted to use the Elliott method in conjunction with his fever treatments at the Miami Valley Hospital in Dayton, Ohio, and found that his results were not quite satisfactory because of the fact that he noted burns of the vaginal mucosa. We find that if we lower the vaginal temperature as compared with the temperatures used in patients who are not subjected to artificial fever at the same time, we do not produce burns. A patient who has a systemic temperature of 106 degrees F. is unable to disseminate as much heat as a patient with normal temperature. It is, therefore, necessary not to raise the temperature of the Elliott applicator too close to 130 degrees F., as in the case with the patient who gets Elliott treatment alone, and to remain within the limit of 124 degrees at the most, and often not quite that high.

**Dr. M. C. L. McGuinness** (New York): I told the essayist that my work would be a comparison between diathermy in ambulatory cases and diathermy with the Elliott treatment. The cases in the clinic are entirely different from those in private practice. We have found in all pelvic infections that if patients are put to bed to stay there long enough and we do the usual things, the condition may clear up. But with women who must work or continue their household duties, when they cannot or will not go to bed, one has to find some special means of treating them.

This was pioneer work done in the Vanderbilt Clinic. The Sloan Hospital authorities did not care for it, did not want it. We got very little cooperation to begin with, though we did obtain some more recently. We thought we would evaluate the Cumberbatch method, which

is intraurethral, intracervical, intravaginal or intrarectal diathermy. Intraurethral and intracervical treatments were given in acute gonorrhea. The Sloan Hospital authorities do not consider a case to be gonococcal no matter what the clinical symptoms are, unless they get the Neisserian germ. So while two-thirds of our cases originally must have started as gonorrhea, and may have been cleared up, or the germ disappeared in the pelvic cases, in salpingo-oophoritis and other conditions, we were told to count only those cases as specific where the germ was found.

Accordingly we had 50 cases of acute gonorrhea. We started them at once with the intraurethral electrode which is about an inch and a half long. That treatment was given for ten minutes. We gave heat to tolerance. This is the one case where one cannot force heat, and in our poor material we had to give very low degrees of heat.

Dr. Bierman and his associates could give very much higher degrees than we. We could never get in our urethral treatments more than about 600, sometimes less than that, 300 to 800 milliamperes at the most.

We gave half the amount in the cervix. We found that we did not get extensions upward. All these cases were diagnosed by the Sloan staff, checked by them, discharged by them. That was our difficulty. When we thought a patient was just about getting on, the staff felt that maybe she did not need any more diathermy and dismissed her.

From the figures Dr. Krusen has shown, too many treatments have to be given in ambulatory cases. We had one case with 52 and another with 42 treatments which were our largest. Usually the treatments in the simple pelvic cases averaged from fourteen to twenty. They were only given twice a week, and the patient was exposed to every kind of danger and trouble and strain the rest of the time.

We did not consider any case cleared or improved unless there had been from three to six examinations made not later than three days after the menstrual period, because we felt one never could know when gonorrhea is cleared up. We felt there should be a five-year period of examination. Only four years and eight months have elapsed and we have not yet checked up our results, so we do not like to make too many quotations about them.

We have found that fever is the method of choice provided one has the cooperation of the patient and of the hospital. We have combined diathermy of the pelvis with the fever, and have been much pleased with the result.

I want to stress that we have not found any dangers or troubles in acute urethritis. We have treated patients from two or three or four days after discovery up to as long as the germ has remained. The authorities have been pleased to say that they think there is something in the meth-



od, but they still would not admit any acute cases to the hospital. They say where they have a clean hospital and cannot have acute gonorrhoids because they cannot take care of them.

We have treated cases varying from acute urethritis, salpingitis, to "broken down" pelvis. All these cases were scheduled for operation. We did not get any cases except the acute gonorrhoids who were not scheduled for operation, so that they were simply sent to us in order to hold them for eventual operation. We were just a stop-gap on the way. They found when some of these patients came to operation that they had cleared up considerably and some of the surgeons said if perhaps we had left them alone, they would have continued and would have been all right.

Of 173 patients who went on for observation, 61 were absolutely clear. There were 107 left. Two-thirds of these were markedly improved. Our trouble was that they were dismissed before we were ready. We did not consider them as markedly improved as did the staff members, but they said we could not *clutter* up the clinic. Besides they did not have any money.

In private practice with this method you should be able to clean up your case in two or three or four weeks, but I still think it should be a year or two, or even three before one is sure that there are no recurrences. I have been on the lookout for recurrences and found there were not many.

Of these 173 cases, three or four had acute gonorrhea, got cleaned up and became pregnant. Fourteen who had chronic disease and did not want to be pregnant nevertheless became so.

Incidentally a few pregnant women afflicted with acute gonorrheal urethritis came for heat treatment in the hope that the heat would cause abortion. The infection was controlled without disturbing the pregnant state.

**Dr. William Bierman** (New York): We are glad to see that the idea of combining elevation of the entire body temperature with local elevation of temperature is now being used at the Mayo Clinic. We have felt for about seven years that it was by far the superior technic. We still believe that the use of some conservative method of heating, such as diathermy or short wave high frequency current in conjunction with systemically elevated temperature is the better technic. We base that opinion upon comparison of the heat produced by the Elliott method and these conservative technics in the living human female.

We made numerous studies, Dr. Horowitz and Dr. Jarrell, taking temperatures in the urethra, at various levels of the bladder and rectum, within the cervical and canal, in the tissues of the cervix

itself, by thermocouples, and in every instance we were able to note the superior heating ability of the converse energies, as contrasted with what amounts to an internal hot water bottle.

**Dr. Lawrence M. Randall** (closing): I agree entirely with Dr. Bierman. We all realize he has done enormous amounts of work and his opinion is one we certainly must value. We are trying this treatment as a matter of comparison, and I do not think we are yet in a position to make a final statement about the combination of the Elliott and fever therapy.

There are two things in relation to these Neisserian infections I would like to emphasize. One is the frequent occurrence of proctitis that I believe is often overlooked, and therefore not treated. We have recently made a definite effort to take cultures from the rectum in cases of Neisserian infection, and the incidence of Neisserian proctitis is much higher than we have heretofore been led to believe. The proctologists tell us Neisserian proctitis is one of the most unsatisfactory things that they have to treat locally.

The second is the matter of cultures. It has only been recently that cultures have been available for the study of the Neisserian organism, and we are now basing our diagnosis and determination of cures on cultures. That is, a patient is not pronounced cured on smear evidence alone. I think this whole subject is one in which there should be one hundred per cent cooperation between the clinician, the surgeon and the physical therapist. I think when that day comes the incidence of radical surgery in the treatment of these cases will be very greatly reduced.

**Dr. Frank H. Krusen** (closing): I mentioned definitely that it mattered little what method was used. Dr. Bierman will be interested to know we now have his particular special type of vaginal diathermy electrodes, and hope to conduct a comparative study of the diathermy method as compared with the Elliott method in these cases, and then hope to report on that combination at some future date.

There is one other point that I think is worth mentioning. That is the idea of prolonged vaginal heat treatments as compared with the one and two-hour treatments that are frequently used now. We use six-hour fevers, why shouldn't we use six-hour local pelvic heatings or eight to twelve or twenty-four hour, if necessary, in treating some of these pelvic infections, but with not quite so high temperatures.

The danger of burns is much greater and the treatment must be very carefully controlled if prolonged treatments are to be attempted. We are branching out in that direction a little bit and hope to consider prolonged vaginal heat treatments in certain cases.

## THE ROLE OF PHYSICAL THERAPY IN FACIAL PARALYSIS \*

OLIVER P. BOURBON, M.D.

LOS ANGELES

The treatment of facial paralysis is a very appropriate subject to be presented to any meeting of otolaryngologists. As the condition occasionally complicates ear conditions, it naturally comes within the field of the otologist. Since the anatomical relations of the facial nerve are such that any attack on the integrity of the nerve from any other cause is a border line disease, an aural examination should always be made to definitely determine the relation of the ears to the particular attack. The otologist should be prepared to treat those cases which are in his specialty, and since the treatment of every type of facial paralysis is the same in the later stage, a study of all forms should be made by him.

Some cases of facial paralysis recover spontaneously in a period of time lasting from a few days to a few weeks. It is in the severe attacks, when careful treatment during a considerable period is required to bring about a recovery that is either complete, or so nearly complete that facial disfigurement is not noticeable, that physical measures are especially useful. After further study, the role of these measures in the treatment of this condition will be better understood and their effectiveness more correctly estimated and evaluated. To aid a little in the understanding of this role and to emphasize its importance, if only by reiteration of known facts, is the object of this study.

### Indications for Physical Therapy

It must be recognized that there are some types of facial paralysis in which the causes that brought on the attack are such that physical therapy can have but little practical benefit. No paralysis of central origin, as a lesion within the pons, can respond to it. It cannot be expected to help a peripheral paralysis that is caused by an intracranial lesion. If the paralysis is caused by a constitutional disease, as syphilis, drug therapy is undoubtedly the more important. If it is due to focal infection or to a purulent otitis media, results from physical therapy cannot be expected until the cause is removed by other measures. In such cases, after the cause is removed, physical measures will aid materially in bringing about a more complete regeneration of the nerve and restoration of its function, or in restoring function more quickly. Drugs, surgery, and physical measures are all useful and should be used as indicated.

### Pathology

It is beyond the scope of this paper to discuss the pathology in minute detail. Suffice it to say that, in most peripheral paralyses, the lesion is either in or external to the petrous pyramid. Whether the paralysis is produced by hemorrhage, by lymphatic engorgement, by focal infection, or by a neuritis due to cold and exposure, there may or may not be an active inflammation present, but there is always an exudate which may be either within or without the nerve sheath, or within the lumen of the canal. The paralysis usually results from the pressure of this exudate on the seventh nerve rather than from any inflammation that may be present.

\* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 9, 1936.

During the course of the disease any exudate that is not absorbed may become hardened and fibrosed. As a result of the inaction and the relaxation of the paralyzed muscles they also may become fibrosed. This fibrosis of muscular tissue leads to metabolic changes and the formation of waste products, with further obstruction to muscle action, and finally to atrophy of the muscles from non-use. Continued pressure on the nerve leads to its degeneration, the muscles becoming more and more denervated until finally their loss of function is permanent.

If the paralysis is caused by surgical or accidental injury, the pathology is somewhat different from that induced by the pressure of inflammation and exudate. In the former class there may be a complete severance of the nerve, or a pressure, not from exudate or edema, but from a spicule of bone, in either case, a condition being present which cannot yield quickly or definitely to treatment by any therapeutic measures.

### Review of Treatment

Rest is an important factor in removing the pathological conditions present in the early stage. This means more than voluntary rest of the muscles by not attempting to exercise them. Pollock<sup>1</sup> recommends the application of adhesive strips to the cheek, extending from the temple downward and ending near the lips, these splints giving rest and support to the sagging muscles.

The application of heat in some form, with the increased hyperemia produced by it, is an effective therapeutic aid in accomplishing the main objects of treatment in this stage — the reduction of the inflammation, the absorption of the exudate, and increased metabolism and repair. Hot compresses, with or without the addition of magnesium sulphate, are useful because they can be applied by the patient himself. A more marked result can be obtained by light treatments than by conductive heat, as they give an increased blood supply to a greater depth. Investigators, among whom are Kovács<sup>2</sup>, Rosewarne<sup>3</sup> and Coblenz<sup>4</sup>, all agree that both infra-red rays and radiant or visible light rays penetrate living tissues, but they differ as to the depth of penetration. While physicists disagree as to the penetration and the properties of the different rays, and therapists differ as to their clinical effects, it has been demonstrated that radiation, by either an infra-red lamp or by a radiant heat lamp, gives good results.

A still greater effect from the application of heat is obtained by the use of a diathermic current because of its deeper penetration. Either conventional or short wave diathermy may be used. If the lesion is external to the facial canal, it is easily reached by any method of applying the heat. If it is within the facial canal, surrounded by dense bone, there is no way of knowing definitely to what extent the heat reaches the affected nerve. It is reasonable to believe, however, that a diathermic current of low milliamperage, applied for a long time, will heat the enclosing bone, not only directly by the penetrating current, but indirectly by the warmed blood from the surrounding soft parts, until finally both the lumen of the canal and the protected nerve will also be heated.

After the paralysis has lasted a week or more, gentle massage to the cheek may be given as suggested by Weisenberg and Alpers<sup>5</sup>. Mennell<sup>6</sup> advises that it be used once daily for a short time immediately after the onset of the attack. Any massage given the affected muscles during the first two weeks should be very gentle and should be preceded by some form of heat treatment.

King<sup>7</sup> reports effective results by use of the Oudin effleuve spark with a non-vacuum electrode, combined with stimulating massage, avoiding any

manipulation that might stretch the relaxed muscles. The Oudin effleuve is applied for its stimulating and contracting effects and for the sterilizing effect produced by the action of the ozone generated. When the paralysis is a complication of an ear condition, she precedes this treatment with a brief application of the short wave current for its heat and metabolic effects. Kovács<sup>2</sup> reports uniformly good results in the early stage by use of the static wave current, preceded by light or diathermy, believing that with this treatment he obtains the mildest possible rhythmic contractions of all the relaxed muscles.

Opinions are divided as to whether any treatment should be tried or whether surgery alone should be used when a known severance of the nerve exists. Ney<sup>8</sup> at one time expressed the belief that a completely severed nerve within the facial canal does sometimes regenerate sufficiently to regain function. Martin<sup>9</sup> contends that when a severance of the nerve is manifest at the time of a mastoid operation, the earliest possible operation for nerve repair is advisable, after avirulence of the causal organism is obtained, on the assumption that there can be no spontaneous recovery or regeneration of the nerve by treatment.

Even though the extent of regeneration is small and the progress is slow, a severed or partially degenerated nerve sometimes regains partial function. It is unimportant whether the therapeutic measures regenerate the nerve directly, or by stimulation of its cells preserve their vitality until the normal repair forces of the body restore them. Any measure that stimulates the action of a normal nerve will increase the vitality of a degenerated nerve if its vitality has not been entirely lost. That drugs do this is generally accepted. That electrical stimulation is effective should also be recognized, this statement being based on the reports of competent observers.

After the acute symptoms, which last from a few days to two weeks have passed, the disease enters the stage of nerve degeneration. The muscles should now be tested for the reaction of degeneration, much valuable information being gained from this test. The greater the loss of response to electrical stimulation, the greater the pressure on the nerve, and therefore the more energetic and prolonged the treatment will need to be.

The objective of the treatment, and therefore the selection of measures, now gradually change. A more complete removal of obstruction to return of function, as softening of fibrosed tissue and removal of waste products, is desired; but also, as degeneration progresses, stimulation and exercise rather than rest are required. Relaxed muscles should be stimulated to exercise and a degenerated nerve, to regenerate. Finally the stimulative effect becomes the principal objective of treatment.

Massage is an effective therapeutic aid in removing the existing pathologic conditions, unless it be during the early days of the attack, and it is particularly useful during the later stage. Pemberton<sup>10</sup> states that it exercises the muscles, removes waste products, and affects the circulation by a dilatation of the capillaries and an increase of the red cell count. As the disease progresses, the more gentle massage should be gradually changed to that form which will exercise the muscles.

#### Electrical Stimulation

After there is a loss of electrical response, treatment by a stimulating electric current has a definite bearing on the regeneration of the nerve without the stimulation of other parts or organs of the body, and without any secondary depressive effect. It probably offers greater therapeutic advantages than drugs, surgery or other forms of physical measures.

It is generally accepted as a fact that the process of electrical stimula-

tion of the neuro-muscular mechanism is an electrochemical action, resulting from the concentration of ions at the cell membranes. There is a certain amount of time necessary for such a concentration as will produce an electrochemical action with a discharge of energy sufficient to cause a muscle contraction. This time, called the chronoxia of a muscle, has been defined as "the minimal time required to excite a contraction by the application of a current of double the minimal strength required to excite the faintest perceptible contraction without regard to the duration of its application."

The chronoxia of a normal muscle has been demonstrated to be from  $1/1500$  to  $1/2000$  of a second, while that of a paralyzed or partially degenerated muscle is rated at from  $1/10$  to  $1/100$  of a second. A healthy neuro-muscular mechanism responds therefore to a quick make and break of the current. In treating paralyzed facial muscles, we are dealing with a mechanism, the excitability of which has been impaired, and it therefore requires a prolonged stimulus for the requisite concentration of ions to produce a contraction. The chronoxia of the muscles is slow and the interruptions must be at longer intervals. That the minimal current strength may be used, the interval between interruptions should always be a longer time than the chronoxia of the impaired muscles.

However mildly an electric current is applied in the beginning, and it should be a mild application in the earlier stage and the beginning of treatment, its strength should be gradually increased until, after the inflammation has been reduced and the exudate has been absorbed, it is sufficient to produce a contraction of the muscles. This exercises them and keeps the fibers functionally adequate until the nerve has recovered sufficiently to activate them. It also aids in preventing, or at least in diminishing, both the contractures of the paralyzed muscles and the disfiguring associated movements of unparalyzed muscles. These effects of a stimulating current on the paralyzed muscles are easily understood because the contraction of a muscle may be seen. It seems reasonable to assume that the current has a similar stimulating effect on the degenerated nerve and its cells.

Considering the different stimulating currents and their applicability in the treatment of facial paralysis, it is possible to select a current that not only has a stimulating effect on the degenerated nerve and the relaxed muscle tissue, but that also assists in the further removal of waste products and obstruction to muscle action.

It is to be noted that all interrupted currents, whether unidirectional, as the galvanic, or alternating, as the faradic, stimulate the tissue cells and excite muscle contraction, even though it may not be an actual contraction, unless the interruptions or alternations are of too high a frequency. It is also to be noted that in the first few days of the attack the muscles show little, if any, loss of electrical response and their chronoxia are therefore nearly normal. It is in this stage, after there has been at least a partial removal of obstructive conditions, that the milder stimulating currents, with a comparatively quick make and break, are particularly beneficial. The faradic current has a duration at break of about  $1/1000$  of a second. If used at all it should be at this time. The sinusoidal current has a duration of the whole phase of  $1/100$  of a second. This current, then, is useful in that period after the electrical responses have begun to fail and before their failure has become marked. Neither of these currents has its interruptions timed to synchronize with the slow chronoxia of muscles after there is a reaction of degeneration of any great degree.

Since muscle contraction is essential and this takes place only at the make and break of the current, the current must be an interrupted one. In the later stage, after the muscles show a marked loss of electrical re-



sponse and their chronoxia becomes slower, the time between interruptions must be correspondingly lengthened, usually to a frequency of one to three seconds.

The unidirectional galvanic current fulfills the requirements for a proper regulation of current interruptions to produce muscle contraction with the minimal current strength. The negative galvanic current produces the chemical changes necessary for the stimulation of the tissue cells and the more complete removal of the pathologic conditions that have not already been fully removed. The interrupted galvanic current therefore is an effective treatment for both stimulation and for the removal of waste products, after there is a considerable loss of electrical response. Turrell<sup>11</sup> considers the modified galvanic current, known as the Lopicque current, with its gradual onset and decline, to be the best treatment for Bell's palsy.

It is not material whether the instrument used is one that will give surging galvanism, one that will deliver the Lopicque current, or one of the simpler forms, except for ease in application. At least it is not of sufficient importance to prevent the physician who has only an inexpensive instrument, from giving the treatment, as there can be but little difference in the results obtained by a straight galvanic current, the interruptions being made by hand with the rheostat, from those obtained by any one of the more complicated instruments. Of importance is the careful and faithful application of a stimulating interrupted current, over a long period of time, and a gradual increase of its strength in such a manner that contractions of the muscles are finally produced.

#### Summary

1. All peripheral facial paralyses belong either within the otologic field or in the field bordering on it.
2. Drugs, surgery and physical measures are all useful in restoring the function of paralyzed facial muscles.
3. The physical measures that are most useful in the very early stage, aside from rest, splints, and hot compresses, are topical and deep heat radiation.
4. Later, before there is the reaction of degeneration, stimulating currents with a comparatively quick make and break, are helpful.
5. Still later, after the reaction of degeneration has become marked, the physical measures of great effectiveness are massage and the interrupted negative galvanic current, with interruptions at longer intervals.
6. Expensive equipment is not needed. Good results can be obtained by making the interruptions with the rheostat if an instrument with mechanical interruptions is not available.
7. Unless either surgery or constitutional treatment is required, physical measures are among the most effective that can be used for the restoration of function to paralyzed facial muscles, particularly in the more severe cases and in the later stage of attack.

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#### References

1. Principles and Practice of Physical Therapy, Hagerstown, Md., W. F. Prior Co., 1934, edited by Mock, Pemberton and Coulter, Chapter 7 in Volume II, "Peripheral Nerve Lesions," edited by Lewis J. Pollock, p. 7.
2. Kovács, Richard: Electrotherapy and Light Therapy, Philadelphia, Lea & Febiger, 1935.
3. Rosewarne, D. D.: Textbook of Actinotherapy, St. Louis, C. V. Mosby Co., 1928.
4. Ibid 1: Chapter 9 in Volume I, "Sources of Artificial Radiation and Their Physical Properties," edited by W. W. Coblenz, p. 3.

5. *Ibid* 1: Chapter 16 in Volume I, "Physical Therapy in Nervous Diseases," edited by T. H. Weisenberg, and Bernard J. Alpers, p. 13.
6. *Ibid* 1: Chapter 12 in Volume II, "Massage in Diseases of Nervous System," edited by James B. Mennell, p. 22.
7. King, Cora Smith: Personal communication to the author.
8. Ney, K. W.: Facial Paralysis, *Laryngoscope* 32:327 (May) 1922.
9. Martin, Robert C.: Surgical Repair of Facial Nerve, *Arch. Otolaryng.* 23:458 (April) 1936.
10. *Ibid* 1: Chapter 6 in Volume I, "Physiologic Influence of Massage," edited by Ralph Pemberton, p. 1.
11. *Ibid* 1: Chapter 9 in Volume III, "Physiologic and Therapeutic Action of Interrupted Currents of Low Frequency," edited by W. J. Turrell, p. 2, 5, 8, 12.

### Discussion

**Dr. Frank Follweiler** (Philadelphia): When we decide upon a course of treatment, we should remember that the best results are obtained by treating early, carefully, thoroughly, and persistently. Many of these cases are frequently neglected, in that the treatment is not begun sufficiently early enough and a diagnosis is not definitely established. The essayist has covered the field so thoroughly that there is little more to add. Certainly the importance of physical therapy in these cases must now be recognized.

**Dr. Farel Jouard** (New York): Dr. Bourbon has stated very well the general principles underlying the physical therapeutic treatment of tractable cases of facial paralysis, such as come under the scope of the otolaryngologist. He has stressed the necessity of first bringing about the dispersion of the exudate by various means, then of gradually stimulating the flagging nerve back toward the normal.

For this purpose he has cited the various modalities which can be used to advantage. There is one form of treatment which the doctor alluded to and which might possibly be discussed in a little more detail. I refer to static electricity. In my own practice, the most satisfactory method I find is exposing the region to prolonged infra-red radiation, or better still, to prolonged ultra high frequency, followed immediately by a prolonged slow sinusoidal wave.

If this procedure is carried on properly, I think it offers about the most satisfactory method of heat and massage, which is really what we are after.

When the nerve can be subjected to vigorous stimulation, the static current is of great value. In this case I use the spark. The spark director is placed in contact with various points to be stimulated and the ball electrode is brought in contact with the director, gradually withdrawing it from an inch to two inches or more, and then approaching it again until it is in contact. This is repeated a number of times and at each repetition there is a stream of very rapid sparks, which causes a surging contraction of the muscle.

**Dr. Charles R. Brooke** (Newark, N. J.): In the search for foci of infection, one

should include dental examination. We must keep in mind at all times the proper combining of our physical agents. While each has some beneficial use, unless they are correctly combined, maximum benefit from them will not be obtained.

I do not agree with the methods of splinting facial cases. We have never had to resort to this. Early treatment, as already emphasized, along conservative lines should be instituted and followed along cautiously, but steadily, over a period of time.

In conclusion I should like to make a plea to those who see these cases early not to defer too long the employment of physical therapy.

**Dr. Lee Cohen** (Baltimore): I want to say something about those cases of paralysis that follow mastoid operations, and offer a word of warning against rushing in too quickly with surgical measures. I have had some experience in the last year and a half with one case, a boy about ten years of age who had had a radical operation done. He was referred to me by his surgeon who went out of town.

He discussed the matter of the facial condition. The patient had a complete paralysis, the most grotesque-looking thing you ever saw. The operation had been done about a year and a half prior to my seeing him. He had pretty marked contractions. Most neurological surgeons say you should wait a year. We felt a year and a half was quite long enough to wait, and we induced the parents to take this boy to Dr. Duell in New York, with the idea of doing a nerve grafting. As you all know, Dr. Duell passed on since then, and the boy came back home.

Last week the surgeon again left town and sent the boy to me. He had some remaining discharge from his ear and his face was almost well, had spontaneously recovered, showing the mistake that would have been made had we subjected that child to an operation.

I have seen three such cases in the last twelve or fifteen years, and I think we ought to wait a year to a year and a half and even longer in some cases, unless we know positively that we cut the nerve in half.

## USE OF AIR IN ARTHROPATHIES \*

HAROLD R. BOHLMAN, M.D.

BALTIMORE

In 1920 Terracol and Colaneri,<sup>1</sup> and Prat,<sup>2</sup> reported on the injection of air — pneumarthrosis — for radiographic studies of a joint. Bircher,<sup>3</sup> in 1922, used oxygen and nitrogen in arthroscopy. Rost<sup>4-5</sup> treated tuberculous affections of enclosed cavities, abscesses and caries by inflation with oxygen; and in the following year fibrous ankylosis was treated in a similar manner. In 1921 Kleinberg<sup>6</sup> injected oxygen into a joint for diagnosis and Kaisin<sup>7</sup> in 1922 reported a similar procedure. Ramond,<sup>8</sup> in 1923 treated three cases of gonococcal arthritis by aspiration, lavage with 2 per cent sodium citrate and injection of sterilized air in sufficient quantity to distend the cul-de-sac, followed by injection of iodized oil. Subsequently Kleinberg,<sup>9-10</sup> Balensweig,<sup>11</sup> and Cattaneo<sup>12</sup> utilized air or oxygen in the diagnosis of semilunar cartilage injuries or loose bodies in the knee joint. In 1924 Purvis and Bilcliffe<sup>13</sup> used oxygen in tuberculous joints. Bernstein and Arens,<sup>14</sup> Werndorff,<sup>15</sup> Ulrichs,<sup>16</sup> Bircher,<sup>17</sup> reported inflation of joints to aid x-ray studies. Bronner<sup>18</sup> found pneumography of aid in diagnosing congenital dislocation of the hip. In 1927, Caccia<sup>19</sup> injected gas into knee joints in treating hemarthrosis and traumatic hydrohemarthrosis. Giacobbe<sup>20</sup> gives an account of air inflation of joints in endoarticular lesions somewhat similar to the above. Reich<sup>21</sup> used it in purulent arthritis in 1928. Rechtman<sup>22</sup> and later Henson<sup>23</sup> also used it therapeutically. Porter and Rucker<sup>24</sup> were the first to report the use of air as such in the treatment of acute gonococcal arthritis, 1929. Burman<sup>25</sup> suggested its use in arthroscopy two years later. Mondor<sup>26</sup> and Vilar<sup>27</sup> discussed the use of air in the same year, and Vlastos<sup>28</sup> published an account of hypodermic injections of oxyradon for arthritis.

Other reports of insufflation of joints appear in the past five years.

### Author's Experience

The author has utilized air in about three hundred cases of varied arthropathy during the past ten years. This clinical experience has led to certain definite conclusions with regard to selection of cases and method of procedure in air injection.

It may be used in any joint which possesses space and into which a needle point can be thrust. It is of no value in ankylosed joints. Beneficial results are in direct proportion to the amount of air which the joint will admit under very moderate pressure. Hence the larger joints are more easily penetrated and yield better results. From the anatomic standpoint and from recorded results the order is — knee, shoulder, hip, elbow, temporomandibular joint, ankle, wrist, sternoclavicular joint, and the digital joints — even tendon sheaths. Extra-articular tissues have been treated intentionally as well as unintentionally. The treatment is especially valuable wherever fluid is present, which is usual in the acute or subacute arthropathies, but may be seen also in the chronic types. Any effusion, whether serous, seropurulent, serosanguineous, sanguineous, or purulent, should be aspirated and the joint cavity fully inflated. The serofibrinous and fibrinous joints, however, should be approached with caution — they are difficult, troublesome, and apt to prove disappointing. Two cases of air embolism have been observed in this group. Acute gonococcal arthritis, if the joints can be com-

\* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 11, 1936.

pletely emptied of fluid and fully distended with air, subside in an amazing manner. In purulent cases air injection should be made preoperatively, and may be combined with lavage of the joint before arthrotomy. One uses it routinely in all knee joints subsequent to arthrotomy and in many other postoperative cases when immediate joint closure is effected. It is invaluable in traumatized joints, especially the knee, where an intra-articular effusion or hemorrhage of any degree has taken place. It may be used in hemophilic joints, but some hemorrhage is apt to recur and the puncture wound may bleed.

The action of air in a pathologic joint is interesting. It exerts a cushioning effect which is immediately soothing. Air is compressible while fluid is not; therefore, the slightest motion in a joint tense with fluid is exquisitely painful; air being compressible yields and relieves this discomfort to a great extent. Fluid in a joint exerts hydraulic action with the slightest movement; this tends to stretch the joint capsule and produce relaxation of the joint; air prevents this, and so insures against chronic disability. It spaces inflamed or irritated synovial membrane, preventing adherence or adhesions. Through pressure, and possibly by creating a new surface with air, it has a hemostatic effect. It often prevents or limits the recurrence of effusion. It may sharply inhibit bacterial growth as is noted where the organism requires low oxygen tension for growth, e. g., the gonococcus. It exerts some biochemical action not yet clearly understood. Burman<sup>24</sup> found that selective staining characteristic of eosin for damaged cartilage disappeared with the introduction of air into a joint, causing a diffuse staining of all surfaces.

#### Technic of Air Injection

The time to aspirate fluid and inject air is early, as early as possible. The technic is simple. Strict asepsis should be observed. The usual ether-iodine-alcohol clean-up suffices. The equipment consists of a 2 cc. hypodermic syringe (preferably Luer) and two needles. A 10 or 20 cc. Luer syringe 2-way stopcock; aspirating needles of varying bores, 12-24 gauge, and varying from 1 to 3 inches in length. A short piece of Dakin tube, a small basin or container for fluid (culture tubes, slides, etc.), and 1 per cent novocain.

Exact determination of the puncture site and plane is most important. The most accessible point and route to opposing articular or hard surfaces should be selected. It is good practice to palpate the opposite (normal) joint at rest, in flexion, extension, and during motion, to determine land marks. After the ether wash, brilliant-green or some other dye may be used for marking. Two lines crossing at right angles and intersecting over the puncture point should be made for orientation. The skin, subcutaneous tissues, and capsule should be carefully infiltrated with novocaine. A needle of bore and length suitable to the joint and suspected fluid having been selected, the stopcock should be set in needle-plunger line. With steady, firm pressure the needle point should be thrust directly into the joint. A fairly blunt, bevel point of about 45 degrees is most suitable. Avoid scratching or grooving the hyaline cartilage. Once in the joint, a gentle pull should be exerted on the plunger; it may be necessary to slowly move the needle point or rotate it to prevent valving by soft tissues (flocculent fibrin may also cause this trouble). Often there is sufficient tension in the joint to force the plunger back, automatically filling the syringe as the needle point enters the cavity. All fluid possible should be aspirated, manual pressure about the joint often proving of help.

Air should be slowly and cautiously injected after first slightly with-

drawing the plunger to assure one's self that the needle point is not in communication with a blood vessel. Where the anatomic situation permits, watch for joint distention. After some air has been injected, the plunger should be withdrawn a little — one should be able to readily aspirate the injected air (sometimes frothy with admixture of fluid). If this is not possible, it is owing to two situations: First, the needle point may be extra-articular; second, something is obstructing the end of the needle. In the latter case the pressure index will be lost and too much air may be forced into the joint. Check freedom of needle point after each refill of the syringe, which, properly located, should be held as immobile as possible. Air may be strained through a dry sterile sponge. Berg<sup>29</sup> devised an excellent apparatus for straining the air and measuring pressure. I have found it most satisfactory and expedient to depend upon thumb pressure on the plunger and the patient's sense of discomfort and increasing tension, as indices for the quantity of air injected, which should be slightly less than the fluid obtained. Injection should be carried only to the point of beginning discomfort. Removal of the thumb from the plunger should result in a slow return of the latter. A dry sponge may be applied with some pressure for a minute or two over the puncture site after the needle is withdrawn; then held lightly in place with adhesive. Oxygen or other gases should never be run from a cylinder directly into a joint cavity. The thumb and plunger method with the needle point free in the joint cavity is the only safe method.

After-treatment consists of cautioning the patient to avoid motion of the joint while there is much tension. Activity should be resumed gradually as the air is absorbed. In arthropathies of the knee and hip it is best to use crutches; in a shoulder case a sling is sufficient; a wrist may be supported by a cock-up splint and sling; a temporomandibular joint may be supported by a bandage under the mandible and over the head. Infected joints, such as the gonococcal type, should be turned and moved about so that air may reach the entire joint surface. Dependent fluid levels, when undisturbed, foster bacterial activity. In the early or very acute stages, cold may be applied; later heat may be combined to promote circulation and absorption. In chronic joints, gentle massage may also be used. Frequency of aspirations and air injections varies entirely with the individual, the particular joint involved, and the severity or extent of the pathologic process. Repeat as often as effusion recurs. Small space joints need a greater number of treatments and more frequently. In larger joints, such as the knee, often one treatment suffices, usually two or three at most — provided a sufficient quantity of air is used.

Persistence of air in the joint varies with the individual, the joint and the pathologic process, as well as the quantity of air injected. It may be absorbed from a small joint in a few hours; it has been noted on the fourteenth day following injection of a knee.

Insufflation of joints is not without danger. Although no infections have occurred, one case developed osteomyelitis of the femur as a result of puncturing the periosteum with the needle point during aspiration and air injection of a knee with staphylococcus pyarthrosis. Injection of too much air may provoke swelling of the synovial membrane and actually increase effusion. Air embolism is the gravest danger. The technic should be followed scrupulously to avoid this serious complication. Two accidents of this type have occurred in this series: One is an elderly colored woman suffering from pulmonary tuberculosis and myocarditis, who was recovering from a recent gonococcal arthritis of a knee. Fibrinous exudate with adherent synovial membrane was present, and an attempt was made to distend the joint with air under considerable pressure. Tachycardia, dyspnea,



precordial discomfort, apprehension, and sweating appeared, the symptoms increasing in severity for fifteen minutes, then gradually subsiding until the patient was quite normal at the end of half an hour. Another such complication occurred in a young white male recovering from an extraordinarily severe gonococcal infection of a knee. Fibrinous exudate valved the needle and unintentionally too much air was injected. While lying down the patient suffered no symptoms, but immediately upon sitting up he noted a scratching sensation in the throat which provoked severe coughing and above mentioned symptoms developed, also some cyanosis. Codein and phenobarbital were administered and eased the patient greatly, all symptoms subsiding in fifty minutes. Both individuals were far more comfortable sitting up; in fact refused to lie down. Apparently air in the right auricle is fairly well tolerated, recumbency tends to carry it into the right ventricle and into the pulmonary circulation, immediately causing respiratory symptoms. A loud gurgling was audible over the entire precordium in both patients. During my student days I suffered an air embolism with some rather novel and interesting sensations similar to the above, because of a malfunctioning suction pump while acting as donor in a blood transfusion. Kleinberg<sup>30</sup> fearlessly and lucidly recounts a very disturbing experience with embolism due to oxygen gas; this should be read by all who contemplate insufflation of a joint. Firor<sup>31</sup> found in a series of six or eight dogs that 20 cc. of air was regularly and easily tolerated when injected into the venous circulation. Some animals tolerated as much as 60 cc. "A marked gurgling and swishing sound was audible in each."

### Summary

Air injection of joints is of diagnostic value. When properly employed, it is a valuable therapeutic measure in selected cases. It does not replace either surgery or physical therapy, and often may be combined with either or both. It is a reasonably simple procedure readily available and quite safe if performed with strict observance of the proper technic. In some cases it is curative; in others ameliorating. It preserves joint function, hastens recovery and adds greatly to the comfort of the patient.

Cathedral Street at Read.

### References

1. Terracol, J., and Colaneri, L. J.: Air Injection Into Joint for Roentgenoscopy, *Presse méd.* **28**:655 (Sept. 18) 1920.
2. Prat, M.: Pneumarthrose Artificielle et Radiographique, *Bull. et mém. Soc. d. chirurgiens de Paris* **46**:677 (May) 1920.
3. Bircher, Eugen: Diagnosis of Knee Disease, *Beitr. z. klin. Chir.* **127**:239, 1922.
4. Rost, E. R.: Treatment of Tubercular Affections of Enclosed Cavities, Abscesses, Caries, by Inflation with Oxygen, *Indian M. Gaz.* **55**:329 (Sept.) 1920.
5. ———: Treatment by Inflation with Oxygen of Tuberculous Affections of Enclosed Cavities, Abscesses, Caries, Synovitis, and Fibrous Ankylosis, *Brit. M. J.* **2**:978 (Dec. 10) 1921.
6. Kleinberg, S.: Injection of Oxygen Into Joint for Diagnosis, *Am. J. Surg.* **35**:256 (Sept.) 1921.
7. Kaisin: Insufflation of Oxygen in Joints to be Roentgenographed, *J. de radiol. et d'électrol.* **6**:34 (Jan.) 1922.
8. Ramond, F.; Janet, J. and Levy, H.: Treatment of Gonorrheal Arthritis, *Bull. et mém. Soc. méd. d. hôp. de Paris*, **47**:200 (Feb. 9) 1923.
9. Kleinberg, S.: Pneumarthrosis as a Diagnostic Aid; Report of Case of Loose Internal Semilunar Cartilage, *Arch. Surg.* **8**:827 (May) 1924.
10. ———: Artificial Pneumarthrosis as an Aid in Diagnosis, *M. J. and Record* **121**:341 (Mar. 18) 1925.
11. Balensweig, I.: Loose Body in Knee Joint Demonstrated by Pneumarthrosis, *Surg., Gynec. and Obst.* **39**:235 (Aug.) 1924.
12. Cattaneo, F.: Diagnosis of Fractures of Semilunar Cartilages by Artificial Pneumarthrosis, *Boll. d. spec. med. chir.* **3**:44 (Jan.-Mar.) 1929.

13. Purves, R., and Bilecliffe, E. J.: Treatment of Tuberculous Affections by Inflation with Oxygen, *Brit. M. J.* 1:906 (May 24) 1924.
14. Bernstein, M. A., and Arens, R. A.: Diagnostic Inflation of Knee Joint, *Radiology*, 7:500 (Dec.) 1926.
15. Werndorff, K. R.: Employment of Oxygen in Bone and Joint Diseases, *J. Iowa M. Soc.* 19:240 (May) 1929.
16. Ulrichs, B.: Roentgen Diagnosis of Tuberculosis of Knee With Injection of Oxygen, *Röntgenpraxis* 2:817 (Sept. 15) 1930.
17. Bircher, E.: Pneumoradiography of Joints, *Schweiz. med. Wehnschr.* 61:1210 (Dec. 12) 1931.
18. Bronner, H.: Diagnostic Value of Pneumography of Joint Cavity in Congenital Dislocation of Hip, *Zentralbl. f. Chir.* 54:3237 (Dec. 10) 1927.
19. Caccia, F.: Gas Injection Into Knee Joint in Treatment of Hemarthrosis and Traumatic Hydro-hemarthrosis, *Arch. ital. di chir.* 18:686, 1927.
20. Giacobbe, C.: Therapeutic Inflation of Joints with Air in Endo-articular Lesions, *Chir. d. org. di movimento* 12:433 (Aug.) 1928.
21. Reich, Rudolph S.: Purulent Arthritis, *J. Bone and Joint Surg.* 10:554 (July) 1928.
22. Rechtman, A. M.: Pneumarthrosis of Knee, *Surg., Gynec. and Obst.* 49:683 (Nov.) 1929.
23. Henson, E. B.: Air inflation of Knee Joint as Therapeutic Measures; Preliminary Report, *West Virginia M. J.* 26:96 (Feb.) 1930.
24. Porter, W. B., and Rucker, J. E.: Air Insufflation in Treatment of Acute Gonococcal Synovitis of Knee Joint; preliminary report, *J. A. M. A.* 92:1513 (May 4) 1929.
25. Burman, M. S.: Arthroscopy or Direct Visualization of Joints; Experimental Cadaver Study, *J. Bone and Joint Surg.* 13:669 (Oct.) 1931.
26. Mondor, H.: Recent Treatments of Gonorrheal Arthritis; General Review, *Paris méd.* 2:37 (July 11) 1931.
27. Vilar, G.: Various Treatments of Arthrosynovitis, *Rev. de especialid* 6:265 (May) 1931.
28. Vlastos, M.: Hypodermic Injections of Oxyradon (Radioactive Oxygen) in Treatment of Arthritis, *J. de méd. de Paris* 51:987 (Nov. 12) 1931.
29. Berg, R. F.: Improved Air Injection Apparatus for Inflation of Joints, *Am. J. Surg.* 8:1277 (June) 1930.
30. Kleinberg, S.: Pulmonary Embolism Following Oxygen Injection of Knee, *J. A. M. A.* 89:172 (July 16) 1927.
31. Firor, W. M.: Personal Communication, Johns Hopkins Hospital.

### Supposed Specificity of H. F. Current

(Continued from page 269)

#### References

1. Danilewsky, B., and Worobjew, A.: Über die Fernwirkung elektrischer Hochfrequenzströme auf die Nerven, *Arch. f. d. ges. Physiol.* 236:443, 1935.
2. Audiat, J.: Action des ondes hertziennes sur l'excitabilité électrique des nerfs. (Ondes amorties, entretenues, courtes), *Rev. d'actionol.* 8:227 (May-June) 1932; abstr., *Compt. rend. Soc. debiol.* 110:876 (July 19) 1932.
3. D'Arsonval, J.: Notes a la Société de Biologie, May 2, 1891; May 6, 1893; July 15, 1893; January 25, 1896; February 8, 1896.
4. Delherm, L., and Fischgold, H.: Le courant de d'Arsonval diminue l'excitabilité neuromusculaire, *Compt. rend. Acad. d. sc.* 199:1688 (Dec. 26) 1934.
5. Weissenberg, E.: Soc. Francaise d'Electrotherapie et de Radiologie 10:535 (Dec.) 1935.
6. Blake, G. G.: An Investigation Throwing New Light Upon "Duplex Therapy" and Other Electro-Medical Applications, *J. Roy. Soc. Arts* 80:128 (Dec. 18) 1931.
7. Gosling, B. J.: In a communication at the Sixth Int. Cong. Phys. Med., May, 1936.
8. Young, J. L.: *Proc. & Trans. Roy. Soc. B.* 121:823, 319, 1936.
9. Pfomm, E.: Experimentelle und Klinische Untersuchungen über die Wirkung Ultrakurzer elektrischer Wellen auf die Entzündung, *Arch. f. klin. Chir.* 166:251, 1931.
10. Hill, L., and Taylor, H. J.: Effect of High-Frequency Field on Some Physiologic Preparations, *Lancet* 1:311 (Feb. 8) 1936.
11. Laubry, C.; Tournier, J.; Walsen, J., and Deglaude, L.: Action des ondes courtes sur le coeur isolé, *Bull. Acad. de méd., Paris* 112:160 (July 24) 1934.

# ARCHIVES of PHYSICAL THERAPY, X-RAY, RADIUM

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## EDITORIALS

### SHORT WAVE SPECIFICITY AND SELECTIVITY

After ten years of intensive experimental research in short wave radiation one should expect that at least the most essential theories would be clarified, and that there would also be general agreement on the basic action of this new energy in physical therapy. This unfortunately is not the case. In this regard one recalls what Goethe so aptly satirized as "the instinct to see only what we know" in humanity's scramble for knowledge. Existing differences in opinion prompt the question whether history at this moment is not repeating on a small scale the old dramas in the conflicts of the sciences in which the guardians of traditional doctrine are once again marshalling authority against what they are pleased to decry as impetuous iconoclasm.

This situation strikingly affects the existing problems of short wave diathermy. The hypothesis of a selective and of a specific action inherent in this type of current has been so frequently misunderstood and abused that its mere mention has been productive of criticisms tantamount to condemnation of the above mentioned concept. To-day this problem is the *bête noire* in this particular type of thermogenesis. Here one encounters confusingly divided opinions in contrast to the full scientific tenure or at least probationary status accorded the concept in most European countries. In America, where interest in this problem has been maintained ever since its germination by Schereschewsky, its acceptance has been vigorously assailed. Under the circumstances it is timely critically to evaluate existing data for the purpose of demonstrating the scope of the biologic action of short waves and of discouraging metaphysical trends in this special domain of thermotherapy.

Reverting to the dawn of short wave diathermy, it was Schereschewsky<sup>1</sup> who advanced the term "specific effect" to denote the presence of some unknown factor absent in other wavelengths. He based that action on an assumed superiority of the displacement over the conduction current inherent in short wave transmission. There is today no accord in regard to the presence of a specifically

elective effect of short wave transmission, as one entirely independent of absolute thermic influence. What has often been interpreted as specificity has in reality been a thermo-optimal selective effect associated with a definite wavelength, that has produced maximal heating in an electrolyte or in living tissue, and this independent of ohmic resistance. Thus the much vaunted proof of specificity must be interpreted even on actual findings as a selective action, because one has as yet to find a single experimental fact that is not synchronously associated with temperature changes. The fact that an emulsified product of alkalinized water and paraffin boils at a lower level, is but an index of thermal selectivity rather than athermic specificity. This also holds true for effects produced on living fish or meat placed in special subtemperature environments.

Short waves undoubtedly possess special characteristics due to their ability of space penetration and their energy absorption in otherwise inaccessible places. It may be due to this point energy absorption that even with minimal dosage physicochemical changes have been demonstrated under the misinterpretation of specific effects. Thus Jorns<sup>2</sup> using a field of 4 and 8 meter waves was able to prove an increase in phagocytes of the treated blood serum. Similar tests with a water-bath gave a negative reaction. Szymanowski and Hicks<sup>3</sup> studied detoxication of diphtheria toxin with a 2 meter wavelength and showed that after a two hour exposure in a cooling environment whose temperature did not exceed 32 degrees C. the toxin value actually sank 50 per cent of its original potency. The same effect could not be obtained in a water-bath. Schliephake<sup>4</sup> has shown that the toxin properties of diphtheria antitoxin could be reduced or even caused to disappear when it was irradiated or subjected to a condenser field of 4.8 meter wavelength. After 45 minutes treatment during which the temperature of the biologic product was unchanged, the antitoxic effect on mice had completely disappeared, while shorter exposures merely diminished its action.

The question whether this action is limited to *in vitro* experiments or is also detected in living material entails equally divided opinions on this concept. In France a substitution theory has been advanced, as untenable as the early ones announced in adjacent countries. The explanation incorporates the theory of an *action ondulatoire* or a *vibration cellulaire*; that is, a resonance of the molecule or cells to short waves of a definite length. This explanation can be regarded as nothing else than speculative reasoning of mystified workers. It speaks for supersonic effects thus far undemonstrable with the superfrequencies associated with physiologic short wave transmission. According to most authoritative opinions the term is a misnomer for what has frequently been interpreted as optimal heating of selective material. This is fully supported by Kowarschik<sup>5</sup> who points out that assumption of specific-electric effects for phenomena which cannot be explained as thermic, means the same thing as abandonment of an explanation or merely the word labeling of a concept. And actually none of the authors who have assumed specific effects has offered any explanation in what manner they are produced. Likewise Hill and Taylor<sup>6</sup> elsewhere in this issue present their impression of supposed specific effects of short waves, which in the main are in accord with the findings of other authoritative students of the problem. In the last analysis here again we see the truism of the practical demand that in science one should first have facts and only then formulate theories.

#### References

1. Schereschewsky, J. W.: Heating Effects of Very High Frequency Condenser Fields on Organic Fluids and Tissues, Pub. Health Rep. **48**, No. 29, 1933.
2. Jorns, G.: Über die biologische Wirkung Kurzer Elektrischer Wellen, Bruns Beitr. **152**:31, 1931.

3. Szymanowski, W. T., and Hicks, R. A.: The Biologic Action of Ultra High Frequency Currents, *J. Infect. Dis.* **50**:1 (Jan.) 1932.
4. Schliephake, E.: *Kurtzwellentherapie*, Verlag von G. Fischer, Jena, 1935.
5. Kowarschik, J.: *Kurtzwellentherapie*, Julius Springer, Vienna, 1936.
6. Hill, L., and Taylor, H. J.: The Supposed Specific Effects of High Frequency Currents on Some Physiological Preparations, *Arch. Phys. Therap. X-Ray, Rad.* **18**:263 (May) 1937.

### ARE WE ROBBING THE OSTEOS?

A friend who evidently believed that we were in need of a little diversion was kind enough to send us a marked copy of the April issue of the "Journal of the American Osteopathic Association," the marked item being an editorial with the ultra-scientific (??) caption: "Kicking Oneself to Health." This literary masterpiece is not signed, as editorials should not be, except by three initials, the meaning of which is given in all modesty in the table of contents. There the full name of the scribe is published for the edification of the uninitiated, the initiated ones evidently identifying him as assistant editor, as per list of personnel on the editorial title page.

Having identified the star, let us tell you the plot of the "drammer." We are charged (the "we" refers to the "so-called old school physicians") with "desperately attempting to enter the manipulative field without thorough study of body mechanics," and all this because there appeared in the January issue of the *ARCHIVES* an article by Dr. Troedsson, entitled: "Lumbosacral Derangement and Its Manipulative Treatment." This contribution, by the way, happens to emanate from a high-class institution, and was presented at the New York session of the American Congress of Physical Therapy. In this address the author of the article manifested admirable familiarity with the anatomy of the fifth lumbar vertebra and sustained his position not only by eminent authorities in the domains of anatomy and orthopedic surgery, but by minute descriptions which were enhanced by accurate diagrams. Our osteopathic assistant editor so "manipulated" this scientific contribution as to lift from the context two and one-half sentences: and as it happens that the words "kick" and "pull" are contained therein, the assistant editor raises a howl because that is his specially patented materia medica to which his ilk only has right of possession. Not enough with this jeremiad, we are told that it "would be with trepidation that an osteopathic physician would undertake a treatment of this type so utterly nonspecific," to which we say: "Thank God"!

We have always had our misgivings about men getting into a profession representing many centuries of scientific endeavor and high ideals through a door made by themselves, but now we find that it is a case of the trailer trying to steer the motor. We have seen in this country at least three different "schools" of medicine go the way of all flesh in spite of their legalization by law-making bodies. We lived them down, because sectarian doctrines have no place in science, and this in spite of the fact that they emanated from men identified as members of the medical profession. Today the camps of cultists, licensed or otherwise such as chiropractors, naprapaths, naturopaths and other apathies burn their fires dimly in the byways of scientific medicine. They lacked the ability or endurance to struggle for recognized attainment and created pseudo-scientific fields of their own making — the more bizarre and fantastic the better for the chance of taking in the shekels from yokels. But when some who have every reason in the world to be modest in their restricted domains venture crude criticisms on men on whose teachings they are compelled to lean, one thinks of the little boy who whistled when he felt his courage might fail him in an unaccustomed environment.

Frankly, we have had a "kick" out of the perusal of the osteopathic out-



burst, but we have also wondered how much of it is convinced self-delusion and how much merely a cry just so as to be heard. Physical medicine is much older than any other discipline of the healing art, and those who feel that any of its agencies belong to sectarian cults evidently are unfamiliar with the rudiments of human history. We do not want to argue with them or even preach to them, because that would be a waste of time, and we have work to do.

But for the benefit of those who still can hear and see we call attention to a very old fable. It tells us that the horse appeared before the throne of the Deity with the prayer to have its appearance improved, in fulfillment of which there stood at its side much to its horror—the camel. Let those who criticize true art and real science take care that they do not have to share the fright of the horse in the fable. In this instance which we have treated perhaps with too much indulgence, one can see the value of the old saying: *Si tacuisses . . . .* if you had kept still you would have remained a philosopher.

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#### NEXT ANNUAL SESSION OF CONGRESS

With the preparatory labors connected with the 1937 session of the Congress to be held in Cincinnati already bearing fruit, there is ample justification for the prediction that this year's convention will be a very successful one. At this time we announce that the medical profession of Cincinnati is not only taking a scientific but also an organizational interest in the convention. Thus one evening will be devoted to important scientific problems as a joint session with the Cincinnati Academy of Medicine, while another important session of the eye, ear, nose and throat section will be held jointly with the Cincinnati Otolaryngological Society. These important organizations will not only add weight to the deliberations, but bring about a better appreciation of the use of physical therapeutic measures in many affections which have not yet become common property.

To this must be added that this year's program will have symposia devoted to such widely separate subjects as fever therapy and fractures, and others which will be announced in future issues of the ARCHIVES. Nor is the program to be limited to strictly technical subjects, for in the diverse sections there will be more or less informal discussions of educational problems, subjects of vast importance for the future of scientific physical medicine.

There are only four months intervening between the mailing of this issue and the opening of the next annual meeting, and we again urge all members of the Congress, all readers of the ARCHIVES and their professional friends to make preparation to attend the next convention, with the assurance that it will prove as profitable as it will be enjoyable from many points of view.

## AMERICAN REGISTRY OF PHYSICAL THERAPY TECHNICIANS

NOTE. — The following revised plan for an American Registry of Physical Therapy Technicians is submitted after considerable deliberation and research. It will be found to possess broad scope and flexibility commensurate with the needs of an operative plan to control any future exigencies that may arise between the relationship of institutional and private physical therapy practice and that of the technician. The equitability of this plan is a recommendation for its adoption. — EDITOR.

### Name

The Registry shall be known as the American Registry of Physical Therapy Technicians. It shall be directed by a Board composed of seven members.

### Objects

The objects of the Registry are:

1. To receive applications for and issue certificates of registration to those who meet the educational and technical qualifications as given under "Eligibility for Certification."
2. To maintain the minimum standards of educational and technical qualifications as given by the Council on Medical Education and Hospitals of the American Medical Association for technicians administering physical therapy in hospitals, clinics and physicians' offices.
3. To cooperate with the Council on Medical Education and Hospitals of the American Medical Association in their investigation, classification, and periodical inspection of schools which conduct training courses for physical therapy technicians.
4. To conduct a placement bureau for registered physical therapy technicians and junior physical therapy technicians.
5. To promote the use of these registered physical therapy technicians and junior registered physical therapy technicians in hospitals and physicians' offices.
6. To cultivate high ethical standards among physical therapy technicians in accordance with the Code of Ethics.

### Board of Registry

1. The Board of Registry shall be composed of seven members (which number

shall include the chairman) to be appointed by the President of the American Congress of Physical Therapy. Only those members of the American Congress of Physical Therapy shall be appointed as members of this Board who practice physical therapy exclusively. These members shall be geographically located so as to represent the important centers of physical therapy activity in the United States. The members of the Board shall be appointed for a period of seven, six, five, four, three, two, and one year respectively. There shall be one new appointment each year and all appointments shall be subject to the verification of the American Congress of Physical Therapy.

2. There shall be an advisory board composed of representatives from national organizations interested in the work of physical therapy technicians and the physicians who use physical therapy in their specialties. This advisory board shall be composed of seven members and include one representative from each of the following organizations: The American Physiotherapy Association, the American Hospital Association, the American Orthopedic Association, and the American Neurological Association, the remaining three to be elected by the American Congress of Physical Therapy. The appointments shall be made by the represented Associations themselves, and the length of the term shall be four years. The other three members shall be physicians specializing in physical therapy.

### 3. The duties of the Board of Registry.

- a. The Board of Registry shall pass on all applicants for registration before they are admitted to examinations.

- b. The Board of Registry shall arrange for the necessary examinations. These examinations shall be conducted by the Board at the annual meeting of the American Congress of Physical Therapy, or at the discretion of the chairman of the Board of Registry. He may authorize the holding of examinations by any member of the Board of Registry, who is then to act as chairman

of a regional board. This regional board shall have the written approval of the chairman of the Board of Registry.

The regional board shall be composed of two or more members, according to the local requirements. The members of the regional board are appointed by the Board member (chairman of the regional board) and his selection shall have the written approval of the chairman of the Board of Registry.

c. Questions for written and oral examinations together with directions for practical demonstrations shall be prepared by the Board of Registry or a committee of that board in collaboration with the advisory board.

d. It shall issue yearly a full list of registered physical therapy technicians and junior registered physical therapy technicians, classified alphabetically and geographically. This directory shall specify the qualifications for eligibility for certification.

#### **Applications for Registration**

Upon request, the registrar will furnish blanks on which formal applications are made for certification, with data to be filled in giving information as to the applicant's preliminary education, technical education, experience in physical therapy, training and experience in related fields, and references from two licensed physicians.

#### **Eligibility for Certification**

There will be two classes for certification:

##### **A. Physical Therapy Technicians.**

1. Applicants who graduated from an approved school of physical therapy. The Board shall accept as approved those schools passed by the Council on Medical and Hospitals of the American Medical Association.

2. Individuals who have worked in Physical Therapy for seven years or more in institutions or organizations acceptable to the Board of Registry. Applicants shall have had a high school education and shall be required to pass a written, oral and a practical examination given by the regional Board. Registration in this group shall not be permitted after January 1, 1938.

3. Inasmuch as the American Physiotherapy Association formed and developed standards of training up to the time that the American Medical Association published its

list of approved schools, this organization functioned in a manner similar to that of the Registry. Therefore members of the American Physiotherapy Association in good standing as of August 29, 1936, the date of the first publication of approved schools by the Council on Medical Education and Hospitals of the American Medical Association, may file application for registration without examination. The examination fee will be waived for applicants accepted under this proviso, but the annual registration fee of two dollars (\$2.00) must be paid. Applications for registration under this classification will not be considered after January 1, 1939.

*Examination:* Passing grade 70 per cent.

Oral examination and practical demonstration of ability in all branches of physical therapy. Fifty per cent of grade.

Written examination covering all branches of physical therapy. Fifty per cent of grade. The results of these written examinations shall be inspected and approved by all members of the board.

**B. Junior Physical Therapy Technicians.** Applicants who have completed high school education and have had four years of experience in physical therapy under the supervision of qualified physicians. These applicants shall be required to pass written, oral and practical examinations of a more limited scope.

*Examination:* Passing grade 70 per cent.

Oral examination and practical demonstration of ability in at least one branch of physical therapy. Fifty per cent of grade.

Written examination covering fundamental subjects. At least elementary knowledge of anatomy and physiology and pathology of diseases commonly coming under treatment of physical therapy. Fifty per cent of grade.

#### **Registration**

Candidates for registration as physical therapy technicians shall make formal application on blanks provided by the Registrar.

Upon receipt of an application, the Registrar shall conduct a preliminary investigation of the applicant and the result shall be filed with the application.

The fee for registration is \$10.00. The

fee is not returnable in case of failure in examination.

The applicant may, after the lapse of six months, be given the privilege of another examination without additional charge.

There shall be an annual registration fee of \$2.00.

#### **Title of Registrant**

The certificate issued by the Board of Registry designating the holder as "Physical Therapy Technician," signifies a person who is qualified to administer physical therapy on the prescription of a qualified physician and who has fully met the minimum educational requirements and who has passed the examinations of the Board of Registry.

The certificate issued by this board designating the holder as "Junior Physical Therapy Technicians" signifies a person who is qualified to assist a physician in administering physical therapy, and who has met the minimum education requirements and duly passed the examination as herein provided.

Holders of certificates may use the letters R. P. T. T. (Registered Physical Therapy Technician) or Jr. R. P. T. T. (designating Junior Registered Physical Therapy Technician) after their name.

All registered technicians shall be permitted to attend without cost sectional and annual meetings of the American Congress of Physical Therapy on the same basis of cost as the regular members.

#### **Revocation of Certificate**

A certificate may be revoked at any time for cause at the discretion of the Board of Registry. A hearing shall be granted upon request.

Candidates shall agree before admission to the register that they will at all times work under the supervision of a physician and that he or she shall not establish a pri-

vate practice in physical therapy. Supervision by a physician shall be actual and not perfunctory. Registrants found to be practicing physical therapy independently of medical supervision shall be removed from the registry.

Incompetence and unbecoming conduct as determined by the Board of Registry shall constitute grounds for revocation of certificate.

An open hearing and adequate defense shall be satisfied by the following conditions:

1. The complaint must be made in writing to the chairman of the regional board who shall conduct a preliminary hearing.
2. The registrant must receive notification of this complaint at least twenty days in advance of the date set for the hearing. The notification is to be made by registered mail, telegram, radiogram or cablegram.

Appeal from the decision of the regional board may be made to the Board of Registry at the annual convention of the Congress. Such an appeal must be made in writing to the national chairman addressed in care of the American Congress of Physical Therapy, not later than thirty days prior to the opening date of the forth-coming convention.

Reinstatement shall depend upon approval of the regional committee with final approval of the Board of Registry.

#### **Code of Ethics**

All registered technicians and assistants shall be required to strictly observe the Code of Ethics as defined by the American Congress of Physical Therapy; namely, that they shall practice only under the prescription and direction of a licensed physician and shall under no circumstances on their own initiative treat patients or operate an office independently.

## SCIENCE, NEWS, COMMENTS

### Dr. Kobak Decorated

The members of the Congress and the readers of the ARCHIVES will be pleased to learn that the editor, Dr. Disraeli Kobak, during the evening of May 2, was the recipient of a high and rare honor through the award of the decoration of a Knight Commander of the Royal Order of St. George. This order was created in the fourteenth century (1390) as a royal order of merit, headed by men of the highest European nobility throughout the centuries, and has awarded decorations ranking from ordinary knighthood to that of the grand cross to men who have rendered unusually distinguished services to humanity. So rarely is this honor bestowed that in the United States there are only three physicians possessing the decoration above the rank of knight-officer.

Dr. Kobak was invested with the decoration and handed the parchment of his new dignity in the presence of a most distinguished assemblage at the Standard Club of Chicago. The Governor of Illinois and the Mayor of Chicago had not only sent telegrams of felicitation but personal representatives to convey to Dr. Kobak their expressions of gratification at the merited distinction. Following the official presentation address, the formal reading of the citation and the investiture with the cross and ribbon of a commander, Dr. Kobak modestly attributed his success to the influence of a number of colleagues, most of whom were in the audience, which had caused him to devote his career to physical medicine. After a collation there were informal remarks by distinguished members of the medical profession and by civic leaders. Dr. John S. Coulter appropriately pointed out that the honor was more than a personal one, that it reflected on the American Congress of Physical Therapy for its influence on the international development of the science and practice of physical medicine.

The ceremonies were conducted by Dr. A. R. Hollender, as toastmaster.

### Pacific Physical Therapy Association Meeting

The regular monthly meeting for April was held at the Hollywood Hospital, April 28, and the following program presented:

1. Report of the Proceedings of the First International Fever Therapy Conference, *Fred B. Moor, M.D.*;

- Symposium on Short Wave Therapy — Part II.

2. Short Wave Therapy in Pneumonia, *John S. Hibben, M.D.*;

3. The Analgesic Effect of Short Wave Therapy in Malignancies, *William E. Costelow, M.D.*

### Guatemala University Honors Titus, de Victoria, and Egan

At the Second Latin-American Congress of Physical Therapy, X-Ray, Radium held in Guatemala City, March, 1937, the board of directors of the National University Faculty of Medical Sciences conferred diplomas of honorary membership of the faculty to Dr. Norman E. Titus, President, New York City; Dr. William J. Egan, Vice-President, Milwaukee, Wis., and Dr. Cassius Lopez de Victoria, Executive Director, New York City.

### Albany Hospital Offers Assistantship in Physical Therapy

There is available at this hospital an appointment as an assistant in the department of physical therapy. A physician who has finished at least one year's rotating internship is desired. In addition to the routine work there will be some time available which may be devoted to research. Problems regarding fever therapy, the treatment of vascular disease by physical means, the treatment of arthritis, etc., should be further investigated. Facilities are available for these studies such as are available in few clinics.

The department is under the direction of Dr. John W. Ghormley. The Theobald Smith Research Laboratories of the Albany Medical College are immediately adjacent to the hospital and are under the direction of Dr. Harold Himwich, Professor of Physiology. Here is offered an opportunity to carry on with animal research.

The proper individual would eventually be able to be responsible for the fever therapy and vascular disease treatments. At present the department sees in excess of six hundred new patients who make nine thousand visits annually. The salary for this position would be \$1,500.00 in addition to full maintenance in the hospital.

C. E. MARTIN, M.D.,  
Medical Director.

### Obituary

It is with profound regret that we have to chronicle the recent demise of our fellow-member Dr. Thomas Leland Baxter, of Newark, Ohio, in his fifty-seventh year of life. Dr. Baxter was graduated from Rush Medical College, affiliated with the University of Chicago, in 1902, and has been a member of the Congress for the past thirteen years. Although he specialized in gynecology and obstetrics, he learned the value of physical therapy during his service with the Army in the World War, and maintained an interest in physical medicine to the end. We extend heartfelt sympathy to Dr. Baxter's family.



## THE STUDENT'S LIBRARY

**THE KINESIOLOGY OF CORRECTIVE EXERCISE.** By *Gertrude Hawley*, M.A., Assistant Director Women's Gymnasium, Stanford University, California. Cloth. Price, \$2.75. Pp. 268, with 107 illustrations. Philadelphia: Lea & Febiger, 1937.

This is a textbook of kinesiology for students, teachers and technicians specializing in the field of corrective exercises. Part one presents a consideration of the structures and functions of certain of the articulations which have a particular significance in relation to corrective exercise. Part two deals with the physiology of exercise, postural standards, suggestions for conducting corrective exercise classes in schools, and a kinesiological analysis of typical corrective exercises. Exercises for infantile paralysis, spastic paralysis and fractures are not discussed in this book. This volume gives exercises suitable for use in any corrective or remedial department where a reasonable amount of personal supervision can be given the individual. For physicians interested in this field of corrective therapy, the work offers authentic and valuable information.

**ANORDNUNG DER NORMALISIERTEN RONTGENAUFNAHEMEN.** By *E. C. Mayer* with the cooperation of *F. Pordes* and *K. Presser*, with a section on normal exposures by *J. Zakovsky*. Paper, pp. 105, with 225 illustrations and a slide rule (in pocket) XII-O. Price RM. 6, Berlin and Vienna: Urban and Schwarzenberg, 1936.

This pocket size brochure which is of practical use to technicians as well as roentgenologists is strictly limited to detailed directions for the execution of roentgenographic examinations of every conceivable part of the human body. After an introduction by the late Professor Holtzknecht the text proper is divided into two parts, a general one giving instructions when and for what reason to prescribe x-ray examinations, and the other special part which gives the detailed arrangements and technic of exposure of any and all roentgenographs known to this discipline of diagnostics. The position of the apparatus and tubes, the proper placing of the part to be subjected to the rays are not only described but illustrated by original photographs and diagrams. The entire work promises especial value because throughout an effort has been made to standardize every technical step. A very small glossary of anatomic terms is evidently intended for lay technicians. A pocket of the book contains an ingeniously prepared combination chart and slide rules which provide the means of finding proper focal distances and time of exposures by one manipulation. The popularity of the little guide is evidenced by the fact that within a short time new editions have proved necessary. The format leaves nothing

to be desired. In spite of the small size of this work it is provided not only with a table of contents but with a well prepared index.

**ENDOCRINOLOGY. CLINICAL APPLICATION AND TREATMENT.** By *August A. Werner*, M.D., F.A.C.P., Assistant Professor of Internal Medicine, St. Louis University School of Medicine; Associate Physician St. Mary's Group of Hospitals; Physician, Endocrine Clinic, St. Louis Hospital. Staff Member, St. Louis City Hospital, Sanitarium and Infirmary; St. Louis Training School for Mentally Defective Children and the Missouri State Hospital No. 1, Fulton, Missouri. Cloth. Pp. 672 with 265 illustrations. Price, \$8.50. Philadelphia: Lea & Febiger, 1937.

"This volume attempts to give to the medical and allied professions such knowledge as we have at the present time on the normal and abnormal physiology of the ductless glands, to depict physical types resulting from endocrine disorder, and to make this information applicable to the recognition of endocrine syndromes." This paragraph lifted bodily from the preface presents the aim the author has set out to attain, an aim which has been more than realized. No man can go beyond the insurmountable borders of scientific limitation, and the present volume is no exception, but it does contain something conspicuous by absence in similar monographs — the relation of the autonomic nervous system. This the first chapter reflects on the man who inspired it, and whom many of our members have had the pleasure of hearing at the recent meeting of the mid-western and southern sections of the Congress — Dr. Albert Kuntz. This important chapter is followed by general discussions on such subjects as calorimetry (basal metabolism), the glands and their postulated hormones, after which the diverse glands are treated at great detail. The pituitary gland alone takes up 124 pages. This is followed by the sex glands (158 pages), the thyroid gland (100 pages), the parathyroid glands (12 pages), the adrenals (46 pages), the pancreas (30 pages) the thymus gland (8 pages) and the pineal gland (5 pages). Obesity of various types (13 pages), diseases affecting osseous metabolism (11 pages), the skin, hair and the teeth are dealt with in a total of 5 chapters. The book concludes with a very brief chapter outlining the procedures of making a diagnosis. The illustrations and the mechanical make-up of the volume are above all criticism. It is all the more regrettable that the scholarship of the work has not been as painstaking as so splendid a scientific effort merits. The bibliography is incomplete, even many prominent American contributors having been slighted, the names of some have been misspelled, and the titles of many foreign articles certainly show poor proofreading. With this criticism there is not the least intention to de-

tract from the informative value of the book. Even men who specialize in this branch of internal medicine will find many valuable data, but it will be the conscientious internist and general practitioner who undoubtedly will derive most benefit from this book, because as the author asserted in the paragraph above quoted from his preface, one certainly obtains a scientific and yet practical survey of all known and many unknown endocrinologic problems.

**A PRACTICAL MEDICAL DICTIONARY of Words Used in Medicine with Their Derivation and Pronunciation Including Dental, Veterinary, Chemical, Botanical, Electrical, Life Insurance and Other Special Terms; Anatomical Tables of the Titles in General Use, the Terms Sanctioned by the Basle Anatomical Convention; Pharmaceutical Preparations Official in the U. S. and British Pharmacopoeias or Contained in the National Formulary, and Comprehensive Lists of Synonyms.** By *Thomas Lathrop Stedman, A.M., M.D.* Editor of the "Twentieth Century Practice of Medicine," of the "Reference Handbook of the Medical Sciences," and of "The Nurse's Medical Lexicon." Formerly Editor of the "Medical Record." Thirteenth, Revised Edition with the New British Anatomical Nomenclature. Illustrated. Cloth. Pp. 1291. Price, \$7.50. Baltimore: William Wood & Co., 1936.

That this work has passed through its thirteenth edition, speaks for its popularity and consistent service to not only the medical profession, but also to a wide public embracing clergymen, lawyers, engineers, and scientists in general "who have need, from time to time, of an authoritative definition of some unfamiliar medical term." It is interesting to note that with this edition the work celebrates its twenty-fifth anniversary. In his preface to the thirteenth edition, the author states that there yet remains some work to be done in this missionary field before all the professional journals of the country and our fellow workers in medical lexicography will have seen the light and returned to the path of correct etymology and orthography from which they have wandered many years ago. We particularly feel this is true as we note a wide variation in the style adopted by diverse authoritative publications. It would seem that an editorial department sometimes has no "last" authority, and

perhaps as Stedman points out, time alone will work out these differences of opinion. We hardly feel that we need take space to commend this work, because it has earned its place with every earnest member of the medical and allied professions. The book of limp binding, is thumb indexed, and while quite complete is not too voluminous for convenience.

**THE 1936 YEAR BOOK OF OBSTETRICS AND GYNECOLOGY.** OBSTETRICS, Edited by *Joseph B. DeLee, A.M., M.D.*, Professor of Obstetrics, University of Chicago Medical School, Chief of Obstetrics, Chicago Lying-in Dispensary, etc. GYNECOLOGY, Edited by *J. P. Greenhill, B.S., M.D., F.A.C.S.*, Professor of Gynecology, Loyola University Medical School; Professor of Gynecology, Cook County Graduate School of Medicine, etc. Cloth. Pp. 704. \$2.50. Chicago: The Year Book Publishers, 1936.

This year book again provides the medical profession with an excellent review of the trends in obstetric and gynecologic literature during 1936. The indefatigable efforts of two outstanding men in these fields, make it easy for the many of the profession, specialist or the conscientious general practitioner, to keep abreast with progress. For possible improvement in the specialty covered by this book, what do you know about the following? Ladin's, or Piscacek's signs for diagnosis of early pregnancy; Visscher-Bowman, and other new tests for pregnancy; the usage of progestin in habitual abortion, and after pains; the hormonal diagnosis of early chorionepithelioma; the new classification of pelvis; and further developments of analgesia and anesthesia in pregnancy. There are also many fine articles on puerperal sepsis, the new born and complications of pregnancy, sterility and fertility, etc. The authors also present many articles dealing with operative technic and reproduce the original photographs of the various steps. Many new operations are described in detail. There is also a section devoted to endocrinology. Personal comments by the authors make the reading material more interesting. It is impossible in a short review to give more details of this excellent book but the reviewer feels that one who is interested in the progress of this important branch of medicine, cannot afford to omit this book from his reading list.

# INTERNATIONAL ABSTRACTS

## Ultraviolet Irradiation in Treatment of Varicose Ulcers, Varicose Eczema, and Varicose Veins. Albert Eidinow.

Brit. M. J. 3965:16 (Jan. 2) 1937.

The technic for varicose eczema is similar to that applied in the treatment of varicose ulceration. There is an intensive exposure to ultraviolet rays, equivalent to six normal skin erythema doses, to localized patches of eczema, and the normal skin for half an inch surrounding each zone is also irradiated. Elastic adhesive bandage is then applied to the whole foot and leg and left undisturbed for one week. The ultraviolet irradiation causes an active inflammatory reaction, followed by edema, blistering and finally exfoliation of the skin. Bandaging the limb with adhesive strapping and thus keeping the treated lesion covered gives relief to the patient, as the painful symptoms following intensive ultraviolet irradiation are thereby diminished. Healing of the skin gradually takes place. The treatment is repeated once a week for about six to eight weeks; by this time healing is well advanced.

At this stage the varicose veins should be treated by weekly injections of sclerosing solutions. The local intensive irradiation is stopped and the skin of the anterior or posterior surface of the whole leg is exposed to the rays once a week at a distance of 30 inches for five minutes, using the quartz air cooled mercury vapor lamp; this is equivalent to two normal skin erythema doses. The limb is bandaged as before. The object of this treatment is to stimulate the capillary circulation and the epidermal cells of the skin of the leg. It greatly relieves the circulatory disturbance caused by varicose veins, and gives much relief to the patient. At the final stages of healing bandages are discarded and the limb is daily bathed in tepid, mildly alkaline water, and olive or almond oil is applied.

## Katholysis in Treatment of Retinal Detachment. A Preliminary Note. H. B. Stallard.

Brit. J. Ophthal. 21:35 (Jan.) 1937.

The therapeutic principle of katholysis is to cause a caustic reaction through the liberation of sodium and hydroxyl ions at the point of the negative terminal, introduced through the sclera into the choroid. Its effect on the ocular tissues is circumscribed, no damage being inflicted on other intraocular structures remote from the area of operation. The choroidoretinal scars appear to be 0.5 to 0.75 mm. in diameter, are well localized and do not appear to cause extensive fibrosis of the choroid, a feature which when

widespread must damage the choroid and interfere with the absorption of the interretinal fluid. In most cases of retinal detachment treated by katholysis there are a few fine opacities in the vitreous over the site of the operated area for three or four weeks but elsewhere this structure is very little disturbed.

Stallard feels that katholysis is of value in anterior dialysis in the lower half of the retina. The operative reaction is well localized and does not spread to the ciliary body, and with the help of the vitreous and gravity the choroidoretinal adhesions seem to be firm enough to hold the retina in situ. Katholysis alone is, however, insufficient to effect firm and reliable union between the choroid and retina around large tears situated in the upper half of the globe and should be augmented by surgical diathermy. Recently it has been the author's practice in such cases to make a number of punctures with the kathode over the site of the hole and to circumvallate its edges with two or three rows of punctures set 0.5 mm. apart and outside this to apply two or three rings of Larsson's surface diathermy, the points of contact on the sclera being placed 2 mm. apart.

## Treatment of Angioma of Face. Frederick A. Figi.

Arch. Otolaryng. 24:271 (Sept.) 1936.

The most effective agents and procedures for the treatment of hemangioma of the face are, in the order of their usefulness, radium, electrocoagulation, excision and injection of sclerosing substances. Ligation of the afferent vessels and various plastic procedures are frequently used to supplement these measures. Application of carbon dioxide snow, electrodesiccation, cautery, introduction of subcutaneous sutures, roentgen therapy, ultraviolet irradiation and application of collodion have a much more limited field of usefulness. While the results obtainable with these forms of treatment vary greatly, choice of therapy is determined largely by experience.

Electrocoagulation has greatly improved the results of treating cavernous angioma in adults. Often a growth of this type can be eradicated by this method with comparatively little scarring, whereas repeated applications of radium when the patient is mature frequently accomplish little. A special electrode is used. It consists of a rigid steel wire several centimeters in length, sharpened at one end and insulated, except for about 3 mm. at its sharpened end, with vulcanite, duco cement or some other nonconductor of electricity. This is thrust into the deeper portion of the tumor directly through the overlying skin.

The current is then applied, and the desired degree of electrocoagulation is carried out. The chief difficulty is in gauging the intensity and the extent of the coagulating process. Usually a slight change in the color of the tumor over an area adjacent to the electrode from the blue or violet-blue to a somewhat lighter shade indicates a sufficient degree of coagulation. However, when a tumor has previously been treated, especially by irradiation, this change is not reliable, and sloughing may follow what has appeared to be only moderately intensive therapy. There is no infallible criterion. The slightest change in color and difference in temperature and consistency of the tissues must be carefully noted. Proficiency in using electrocoagulation is likely to be attained only through experience with a number of cases. Too extensive coagulation produces sloughing, which may involve a considerable area of the overlying skin and necessitate major plastic repair. Insufficient coagulation, on the other hand, is likely to accomplish little, necessitating an undue number of operative procedures, so that the patient may become discouraged and abandon the treatment before the desired result is attained.

Frequently it is of decided advantage to precede electrocoagulation by ligation of the afferent and the efferent vessels supplying the tumor. This is especially true when these vessels are large and the tumor has an expansile impulse or palpable thrill, since with the circulation within the mass reduced, the coagulating process proceeds more rapidly and the degree of coagulation can be more accurately gauged. The skin covering the tumor at times is so thin that it is practically impossible to avoid destroying it as the deeper portion of the tumor is electrocoagulated. In such cases it often is of advantage to introduce an insulated electrode into the growth through the adjacent normal skin. The slight coagulation resulting from the escaping steam about the point where the electrode perforates the skin usually is of no consequence, unless the deeper tissues have been excessively heated. As a rule these points heal without infection or sloughing. Unless there is sloughing, the coagulating process may be repeated in approximately two months. While electrodesiccation is sometimes used in the treatment of capillary angioma of the skin, it is as a rule advisable only for a small, superficial lesion because of the unsightly white scars produced. These scars often stand out in decided contrast to the surrounding skin, and the cosmetic improvement is unsatisfactory. In a wide experience in the treatment of cavernous angioma of the face with electrocoagulation during the past eleven years, no serious complications were encountered. Care must of course be exercised when electrocoagulation is encountered and employed in an area adjacent to a branch of the facial nerve or near a large blood vessel. However, neither paralysis of the facial nerve nor active secondary bleeding has thus far occurred.

#### **Artificial Fever Therapy in Ocular Syphilis.** **A. M. Culler, and W. M. Simpson.**

*Arch. Ophthalm.* 15:624 (April) 1936.

Culler and Simpson subjected fifty-eight patients with syphilis who had an ocular complication of the disease to artificial fever therapy. In the fifty-eight cases diagnosis of the primary conditions was made in sixty-two eyes. In the 116 eyes associated secondary conditions due to syphilis were observed. The Kettering hypertherm was used for the induction and maintenance of fever. Approximately fifty hours of fever with temperatures above 105 degrees F. in ten weekly sessions of five hours each was the rule. A course of thirty injections of bismarsen was given in conjunction with the fever treatments. Most of the patients with ocular syphilis who were chosen for this study had failed to respond to orthodox therapy. Of the eleven patients with interstitial keratitis, eight had experienced recurrences and ten had failed to respond to chemotherapy. The duration of the disease and the tendency to recurrence appear to be distinctly lessened after the adequate fever therapy combined with chemotherapy. The response is most prompt in the cases in which an opaque central disk of plastic exudate exists. In ten cases of exudative uveitis prompt clinical improvement became apparent in every instance after the first one or two fever treatments. Nine patients recovered useful vision. Favorable response occurred in the lesions of fourteen patients with optic neuritis and neuroretinitis. All the patients recovered useful vision, although nine have residual pallor of the disk and some degree of contraction of the fields. Active neuritis of the optic tract appears to be arrested by fever therapy. Active choroiditis in seven patients subsided with fever therapy, with residual scars and defects of the fields. Good central vision resulted in all but one eye. In sixteen patients with atrophy of the optic nerve the visual acuity and visual fields remained practically unaltered after a course of fever therapy combined with chemotherapy. The greatest field of usefulness for artificial fever therapy combined with specific therapy will ultimately be in its application to the early manifestations of syphilis, with a view to prevention of the often disastrous ocular complications. — *Abst. J. A. M. A.* 106:2104 (June 13) 1936.

#### **Hypersensitiveness to Cold; Treatment With Histamine and Histaminase; Report of Case. Grace M. Roth, and B. T. Horton.**

*Proc. Staff Meet. Mayo Clinic* 12:129 (March 3) 1937.

The authors report a typical case of hypersensitiveness to cold with the following observations of reaction to injection of certain drugs or exposure to cold applications. They state:

There was a striking similarity in the response of the gastric acids to exposure of one hand to cold and to the intramuscular injection of 0.38 mg. of histamine.



The response of the gastric acids on exposure of one hand to cold and to the intramuscular injection of 100 mg. of acetylcholine was not similar.

Although previously published methods for desensitizing subjects hypersensitive to cold have been entirely satisfactory, the use of histaminase offers an additional method for the treatment of subjects who are hypersensitive to cold.

**Ultraviolet Component of the Sunlight of Portland, Oregon. Measured by Acetone Methylene Blue Method. Ida A. Manville.**

*Am. J. Dis. Children* 53:39 (Jan.) 1937.

Studies of the ultraviolet component of Portland sunshine indicated that the daily average of ultraviolet radiation for the year 1928-1929 was 3.36 units and for the year 1929-1930, 6.2 units. During the second year of observation there was a 26 per cent increase in the amount of rainfall. The temperature remained the same. There is a reciprocal relationship between the incidence of forest fires and rainfall and the amount of ultraviolet radiation.

Between the hours of 10 a. m. and 1 p. m., 44.5 per cent of the daily total of ultraviolet radiation was received. The average amount received during this time was 2.76 units. The average temperature at noon for each year was 54.3 F. It is pointed out that because of the mild noon temperature, because of the richness of ultraviolet rays of the sunshine at this time of day and because of the necessity of irradiating only a small part of the body at a time and at intervals which need not be shorter than from seven to ten days, it is possible to treat rickets effectively the year around. The possibility of obtaining glazing materials or fabrics of a high degree of transmissibility offers a means of providing for longer exposures during that period of the year when it might not be possible to use direct solarization.

**Climate and the Streptococcus-Rheumatism Relationship. William B. Sharp, and Mildred B. John.**

*J. Infect. Dis.* 60:15 (Jan.-Feb.) 1937.

Sharp and John point out the influence of climate on disease. In the southern section of the United States it was observed that a hospital admission rate of acute rheumatic affections was about 15 per cent as high in Galveston, Texas, as in Chicago, Illinois. The warmer climate accordingly, tends in this degree to prevent or mitigate the attack. The influence reaches its peak in the summer but is pronounced throughout the year. The spread of hemolytic streptococcus is at a low level during the summer season, but not throughout the year like rheumatism. The incidence of uncomplicated rheumatic fever was found to be reduced to 28 per cent and that of Sydenham's chorea to 3 per cent of the northern figure. This difference between the two affections would not be expected if the lowered incidence were solely in response

to lighter streptococcal exposure. The observations indicate that a diminution in the carriage of streptococci is not the likely instrument of control over rheumatic attack.

**Effect of Artificial Fever on Clinical Manifestations of Syphilis and the Treponema Pallidum. Clarence A. Neymann.**

*Am. J. Psychiatry.* 93:517 (Nov.) 1936.

It has been shown that electropyrrexia is an effective treatment for all forms of syphilis of the central nervous system. Temperatures at 41 C. (105.2 F.) and above, maintained for at least two hours, kill most of the treponemata pallida in the human body and, consequently, all chancres and skin lesions heal promptly after such treatment. The physiological changes observed during hyperpyrexia cannot account for the treponemacidal action of fever. The fever itself must, therefore, kill these organisms. All the treponemata are not destroyed by this therapy, since those that have reached the deeper tissues, especially the lymph glands, become heat and chemoresistant. Therefore, it is advisable to combine pyretotherapy with arsenicals and heavy metals in the treatment of all forms of syphilis.

**Treatment of Radiodermatitides. H. Bordier.**

*Strahlentherapie* 56:205 (June 20) 1936.

Bordier discusses the dermatitides and their malignant complications that occur in workers with roentgen and radium rays or after treatment with these rays. He points out that numerous antiseptic preparations were tried but failed. The results of the remedies that were intended to influence the nutrition likewise failed to come up to expectations. Brocker suggested the use of infra-red rays and obtained favorable effects with these rays in two cases of ray dermatitis. The author, however, prefers diathermy, calling attention to the favorable effect exerted by the high frequency currents on the trophic disturbances in the tissues. If the ray dermatitis is in a region in which the tissues consist largely of fat (abdomen) and the circulation of the humors is deficient and vitality of the tissues is impaired, the treatment must aim at increasing the vitality by stimulating the circulation of blood and lymph fluid in the region of the ulceration. Diathermy exerts a hyperemic action not only in the region of the ulceration but also in the tissues underneath. A lead electrode is applied 3 or 4 cm. from the edge of the ulcer. A second electrode is applied on the other side of the ulcer, so that the high frequency current passes through the tissues under the ulcer. The treatments are applied in series of twelve or fifteen sessions. The intervals between the sessions differ from case to case, but the interval between the series does not exceed a month. For the ray dermatitides that develop in tissues that have little fat (face, hand, leg and so on), the author recommends coagulation by diathermy, the aim being to destroy the tissues that have been injured



by the rays. Following the coagulation he applies gauze compresses saturated with 1 per cent phenol. The bandages are changed daily. For the ray dermatitides that assume a malignant character, the author likewise recommends coagulation by diathermy. He employed it for twenty-five radiologists who suffered from malignant degeneration of keratotic fields. He cites passages from some of the reports written by the radiologists themselves. — *Abst. J. A. M. A.* 107: 917 (Sept. 12) 1936.

**Galvanic Falling Reaction in Patients with Verified Intracranial Neoplasms. Edwin J. Blonder, and Loyal Davis.**

*J. A. M. A.* 107:411 (Aug. 8) 1936.

The inconsistent results obtained in the clinical application of the galvanic falling reactions have been due to (1) voluntary interference by the patient, (2) a current of large amounts, which produced a spread reaction, and (3) pain, which besides being disagreeable produced additional movements to those induced by vestibular stimulation. The galvanic falling reaction by use of a balance board has proved to be as accurate as the caloric test and produced consistent results. The patient was placed in the normal standing position with the eyes closed, on the platform of the balance board, which was arranged so that a normal patient could maintain his equilibrium without effort. Any change in the patient's center of gravity would immediately be registered by a lowering of one side of the balance board. Circular moist electrodes, connected to the galvanic machine were used. For unilateral stimulation of the labyrinth, one electrode was placed on the mastoid and the other on the sternum.

Experimental evidence obtained on decerebrated cats indicated that the galvanic current, as used with the balance board to produce falling, is not localized to the brain stem but has a peripheral action. The galvanic falling reaction appears to be a test for otolithic labyrinthine function, which we hope with the accumulation of a large series of patients with defective vestibular arcs will lead us to isolated lesions in the vestibular postural pathway.

**Hyperpyrexia Induced by Hydrotherapy in Treatment of Chorea. Harry Lowenburg and Sondra Nemser.**

*Arch. Pediat.* 53:722 (Nov.) 1936.

Three cases of chorea are reported which were treated by prolonged hot water baths. Two appeared to be definitely and completely relieved of attacks; one less so. Similar to other established methods it is possible to induce hyperpyrexia by the use of such baths. The temperature of the patient is rapidly raised with the pulse rate being proportionately increased and respiratory rate less so. The effect on chorea of hyperpyrexia induced in this manner is the same as that of hyperpyrexia induced by elec-

trical apparatus, viz., the attacks may be brought under control but relapses may occur. No ill effects were noted in a case complicated by compensated cardiac valvular disease.

The advantages of this method of inducing hyperpyrexia are its simplicity, its accessibility, either in the home or in the hospital, the lack of need for expensive apparatus or for expert supervision. Should ill effects arise, hyperpyrexia may be very quickly terminated by either removing the patient from the bath or by quickly reducing the temperature of the bath by the addition of cold water. In contrast to medicinal measures which are used to induce hyperpyrexia, this method possesses none of their disadvantages and known dangers. The duration of the hyperpyrexia induced by hydrotherapy is not quite as long nor is the intensity of the hyperpyrexia quite as great. This may be a disadvantage when a longer period of hyperpyrexia is thought to be necessary.

**Treatment of Birthmarks. Everett C. Fox.**

*Urol. & Cutan. Rev.* 40:820 (Nov.) 1936.

This type of vascular nevus is usually characterized by a small central vascular punctum (telangiectasia) from which smaller vessels radiate. Removal is accomplished by electrolysis. The small needle is inserted into the central puncta and .5 to 1 ma. of current is applied for one to two minutes. Blanching and slight edema appear and the vessels become obscured. Treatment is repeated after an interval of a few days until the lesion is completely destroyed. Destruction may be obtained by use of endothermy by coagulating the central puncta with a weak current, but scarring is more likely to follow than by electrolysis. The radiating vessels may be sclerosed by inserting the electrolysis needle into or adjacent to the vessel wall and applying the current as described for the central dilated vessel.

**Surgery of Retinal Detachment. Samuel J. Meyer.**

*Illinois M. J.* 70:149 (Aug.) 1936.

During the past eight years Meyer operated on about 235 cases of retinal detachment. After trying other methods he adopted the Weve technic. By this is meant multiple punctures of the sclera with the long flexible steel needle with 50 to 75 milliamperes of diathermy current. The endeavor is made with this needle to lay a barrage of punctures around the hole or holes with the purpose of producing an adhesive choroiditis which will hold the retina in place. The Weve technic was a decided improvement upon the previously employed methods, especially in the ease with which it may be performed. However, there is no method or technic that is altogether foolproof, each having certain advantages in the hands of the expertly trained operator.